Ethnic and Gender Discrimination in Rental Housing Market: Evidence from Meta-Analysis of Correspondence Tests, 2006-2017[*]

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Abstract We present a large review of all studies that tested discrimination against minority ethnic groups in the rental housing market with the correspondence tests method. Moreover, we perform a meta-analysis of correspondence tests from 25 separate studies conducted in OECD countries between 2006 and 2017, containing more than 300 estimates of effects and representing a total of over 110 000 emails sent to private landlords or real estate agents. In addition to presenting overall results of recent studies, we focus on subgroups of specific correspondence tests in order to highlight the differences across ethnicity, gender, type of landlords, procedure, continent, and type of information provided in applications. We provide evidence that both gender and ethnic discrimination occur in the rental housing market in OECD countries, such that minority-sounding names and male names applicants are discriminated (especially for Arab/Muslim applicants). We show the existence of interactions between ethnic and gender discrimination: gender discrimination is larger for Minority-sounding names than for Majority-sounding names. Thus, ethnic Majority women are the most favored on this market in OECD countries while Minority men are the most disadvantaged. Moreover, we highlight that this discrimination mainly comes from agents' preferences rather than statistical discrimination. Finally, it seems that real estate agents discriminate significantly less minority applicants than private landlords do. These results are robust to the estimation method used (random effects, fixed-effects and unrestricted weighted least squares methods).

Keywords: ethnic and gender discrimination, rental housing, correspondence test, meta-analysis, review.

JEL codes : J15, J16, C93, R21

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1. Introduction

The right to housing is recognized as a universal human right. Like employment, access to housing is a crucial issue for people. Its involvement in individual's life is such that it must be protected. Indeed, it affects health, family, access to employment, availability of public services and education. Thus, from a socio-economic point of view, it is very important for individuals, whoever they are, to be treated equally in access to housing. Nowadays, the principle of non-discrimination, concerning ethnic, religious, disability, sexual orientation, age or gender is guaranteed by many international and European texts (e.g. Treaty on the functioning of the European Union). Despite this, for many decades, field experiments have demonstrated the presence of discrimination (sometimes very high) in the housing market, inducing many adverse economic and social consequences for targeted groups, such as worsening of residential segregation in less attractive neighborhoods (Denton 1999; South and Crowder 1998), poorer access to education and employment (Yinger, 1995, Angrist and Lang, 2004, Hardman and Ioannides, 1999), and an obvious decrease in welfare and well-being for individuals belonging to discriminated groups.

There are many reasons why individuals belonging to one group are more likely to obtain something than those belonging to another group, but this cannot always be seen as discrimination. There is ethnic discrimination when "one person or a group of persons is treated less favorably than another is, has been or would be treated in a comparable situation on grounds of racial or ethnic origin" and an "indirect discrimination occurs where an apparently neutral provision, criterion or practice would put persons of a racial or ethnic origin at a particular disadvantage compared with other persons, unless that provision, criterion or practice is objectively justified by a legitimate aim and the means of achieving that aim are appropriate and necessary" (European Union's Directive 2000/43/EC, known as « race Directive »).

Discrimination in the housing market can take various forms and must be fought accordingly. It can be related to housing supply on the market, it can affect the occupation of a dwelling by a person, but it can especially taint the intermediate phase, the process of allocation of a rented or sold housing.

Discrimination linked to the supply of housing relates to circumstances in which the very characteristics of housing available make them inappropriate for certain categories of people, who are therefore excluded from it. Therefore, public authorities must ensure the development of housing adapted to all categories of population. If not, this gives rise to so-called "indirect" discrimination. Discrimination can occur during the occupation of the dwelling, once the person has entered the premises: an individual harassed by his landlord, his neighbors or a public authority, will find it difficult to remain in his home. Finally, discrimination can affect the process of allocating housing, this is the case when a private landlord or a real estate agent refuses to rent or sell the property to an individual for discriminatory reasons.

This last form of discrimination can come from two sources commonly presented in the literature: « Taste-based » discrimination refers to discrimination, which occurs simply due to the fear of difference. This means that agents who discriminate have personal hostile attitudes towards a foreign ethnic group (xenophobia, racism, or also personal preferences of other kinds) or comply with the negative attitude of the group of individuals to which he/she is attached (Becker, 1957; Yinger, 1986). In the housing market, this corresponds to the case where private landlords or real estate agents discriminate because of their personal preferences or do not accept individuals from another ethnic

group, so as not to displease their other clients of the same ethnic group. This type of discrimination is hard to fight because it comes from preferences rooted in individuals. Therefore, such a change of mentality requires long-term work.

"Statistical" discrimination, which is less intuitive, occurs in the presence of a lack of correct information about the discriminated ethnic group (Phelps, 1972; Aigner and Cain, 1977). Thus, ethnic origin is taken as a proxy for unknown characteristics. In these conditions, an individual may decide to discriminate a person belonging to a foreign ethnic group in favor of an individual of his own group because it "reassures" him. This type of discrimination therefore stems from a certain risk-aversion and a way to reduce it consists in the provision of more correct information on the economic and social conditions of the discriminated ethnic group.

Despite the fact that procedures and conditions for allocating public or social housing are regulated by law, when discrimination is discovered, law decisions remain relatively rare. It seems that it would be more efficient to fight against this phenomenon *ex ante*: fight against racism or provide more correct information on minorities in order to reassure real estate agents or private landlords. For that purpose, it is necessary to know the extent of discrimination in this market, which is one of the main objective of this paper.

Many field experiments have been carried out with the intention of detecting ethnic discrimination in rental housing markets in OECD countries. The results converge to one direction: there is significant discrimination against ethnic minority groups in the rental housing market. For a good review of these experiments, see Riach and Rich (2002).

Three different approaches have been used in these field experiments. The first approach uses audits or personal approaches (in person-test). With this approach, two testers (most of the time) are trained in order to make equivalent enquiries when they meet private landlords or real estate agents. The only thing that differentiate these testers is ethnicity, the variable of interest. A different treatment of testers by agents is considered as discrimination.

However, audits have some defaults, which can create some bias in results. The main one is precisely the fact that it is difficult for testers to differ only by their ethnic background. Indeed, this kind of experiments require that testers are identical in all other visible characteristics, such as age, dialect, beauty, sympathy, charm, … (Heckman and Siegelman, 1993, Heckman, 1998). Moreover, even if all these factors are identical, it is quite possible that the private landlord or the real estate agent chooses an individual over another for a reason that escapes the experimenter, other than ethnic origin. Furthermore, after training and all recommendations provided by the experimenter to the testers, the experimenter is not able to observe everything that happens during the meeting between the two parties. Yet, testers are sometimes informed of the purpose of the study (or have easily guessed), which may motivate them, implicitly or not, to produce results in accordance with their beliefs about ethnic discrimination towards their group. Thus, the main problem of this approach is the lack of control of the experimenter.

Another approach consists of in-person tests conducted over the phone. In this type of approach, the experimenter can be present during the interview, which allows more control. In addition to announcing a name corresponding to a specific ethnicity, testers' accent is an attribute that can be fairly easily identifiable over phone in order to detect ethnicity (Purnell et al. 1999; Massey and Lundy

2001). However, once again, the testers must have exactly the same other dimensions, such as dialectic, sympathy, repartee etc… Another weakness of call audit (which is also the case for personal approaches) is that the nature of the oral responses is really subject to interpretation. Indeed, a very courteous answer may very well hide deep racism. For example, when a private landlord or a real estate agent meets a tester or answers the phone, he/she will not necessarily dare to display his hostility during the conversation if the ethnicity of the tester does not suit him (see Heylen and Van den Broeck, 2016, Verhaeghe et al., 2017).

A solution to these problems is to implement experiments using written applications. With the rapid expansion of the housing market on the Internet, email has become one of the most common way to correspond with a private landlord or a real estate agent. Thus, in this latter approach commonly called "correspondence test", the experimenter creates a certain number of fictitious applicants, which differ only by their proper ethnic origin names and then sends out written applications by e-mail in response to housing advertisements. To avoid detection, emails must not be strictly identical (when more than one email is send to the same agent), but all essential characteristics, such as experience, qualification or even the wage bracket, must be closely matched in order to differ only by the variable of interest[1]. Thereby, this approach is much easier and less expensive (there is no need to hire actors and train them) than in-person audits or phone approach and allows greater control over the application process. With this method, experimenter has the advantage of being able to experiment on real data (and thus to have an empirical validation) while having a control of the variables close to a laboratory experiment. Therefore, the possibility of sending a very large number of applications in a quick way makes it possible to measure the discriminatory practices of real estate agents or private landlord at the initial stage of the rental process. However, this method is not free from weaknesses: a limitation with sending written applications is precisely the fact that ethnicity is only signaled via names. Indeed, the name is used as a proxy of the ethnicity, thus some ethnic names may not be correctly perceived and can therefore be misattributed by real estate agents or private landlords. Moreover, it might be that the chosen names reflect something other than ethnic origin, such as a certain social class, which the experimenter had not foreseen (Bertrand and Mullainathan 2004, Pager 2007). Another weakness of this approach is that discrimination is considered only in the response stage, not in the showing stage, where further discrimination can take place.

Since Carpusor and Loges (2006), the first correspondence test in order to detect discrimination in rental housing market, this approach has become widespread because of its practicality and efficiency. No correspondence tests were conducted solely to determine gender discrimination in the housing market, but through the 29 tests studies that were conducted to determine ethnic discrimination, 14 of them reported their results by gender too.

A qualitative review of a dozens of these thirty studies was produced by Rich (2014) and Oh and Yinger (2015). Since the last review, many studies on the subject have emerged, especially in 2017. There are now more than twice as many studies, and almost three times more countries are concerned, hence the importance of providing a new review, and a quantitative one.

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[1] Consider examples of emails sent (Bosch et al., 2010): "Hello, I am interested in renting this apartment. I would be very grateful if you contacted me. Thank you. NAME" or alternatively: "Hi,
I would like to have a look at the flat. Please email me if the flat is still available. Thank you. NAME".

In this article, we construct a database of correspondence tests from 25 separate studies containing more than 300 estimates of effect sizes conducted in OECD countries since 2006 in order to detect discrimination against ethnic minorities in the rental housing market, representing a total of over 110 000 emails sent to private landlords or real estate agents.

Our contribution to the field is threefold: first, we present a large review of studies that tested discrimination against minority ethnic groups in rental housing market with the correspondence tests method, allowing the literature to be really up to date. Then, we present a quantitative analysis of both ethnic and gender discrimination in OECD countries through meta analyzes in order to measure the extent of discrimination. In addition to presenting overall results of recent studies, we focus on subgroups of specific correspondence tests in order to highlight the differences across ethnic background, gender, type of landlords, procedure, continent and type of information provided in applications. Our conclusions are robust with random effects (R-E), fixed-effects (F-E) and unrestricted weighted least squares (WLS) models.

Our aim is to answer those three simple questions: How, how much, and why?

To our knowledge, no study has accomplished meta-analyzes in order to compare and examine the results in the studies reported. Indeed, to really compare studies among them, one must be able to code their relative differences. For example, it is not relevant to give as much weight to a study with a very small sample than to a study with a very high sample, even if they come from different countries. Furthermore, very few studies have compared the correspondence tests conducted in the rental housing market by separating the types of responses provided by real estate agents or private landlords. Indeed, two main types of responses exist and are noted by authors, and when we can avoid it, it is not necessarily good to mix ratio of them. Yet, this has often been the case in literature. That is why we choose to present a meta-analysis on each type of response provided by the private landlord or real estate agent.

At the initial stage of the rental process, we find that majority candidates are almost twice as likely to be chosen (getting a positive response while the other applicant does not) by real estate agents or private landlords compared to applicants belonging to the minority. Moreover, individuals belonging to the majority are more than twice as likely to be chosen than Arab/Muslims applicants. Female applicants are almost 30 per cent more likely to be chosen than Male applicants. However, this result is different depending on the group of applicants: women belonging to an ethnic minority are 34% more likely to be selected by an agent than men belonging to the same minority. This result is even higher when we compare Arab/Muslim women with Arab/Muslim men: women are 50% more likely than men to be favored. Finally, a woman belonging to the majority has "only" 20% more chance of being chosen than a man belonging to the majority. Therefore, there is an interaction of ethnic and gender discrimination: gender discrimination is larger for Minority-sounding names than for Majority-sounding names. Thus, Female majority sounding names are the most favored, while Male minority names are the most disadvantaged (especially Arab/Muslim Male). We also reveal the presence of strong tasted-based discrimination: providing more correct information about the applicants does not decrease discrimination against minorities. Finally, it seems that real estate agents discriminate significantly less minority applicants than private landlords do.

The remainder of the paper is as follows. In the first section, we present an up to date literature review of the 29 studies that tested discrimination against minority ethnic groups in rental housing market

with the correspondence test method. In the second section, we present the method and data used to carry out the meta-analysis considering publication bias. In the third section, we provide overall results and discuss them: we present results for all minorities and then focus on ethnic and gender discrimination against only Arab/Muslims. Moreover, we propose a quantitative analysis of statistical discrimination. In the fourth part, we show a multivariate meta-regression analysis with R-E, F-E and unrestricted WLS econometric models in order to examine the explanatory variables and their impact on the level of discrimination. We conclude the paper in last section.

Literature review

Many correspondence tests have been realized in order to detect discrimination towards ethnic groups in the rental housing market place since Carpusor and Loges (2006) in OECD countries. To the best of our knowledge, we can count 29 of them, covering 15 countries. We present each of them by continent and countries concerned, in chronological terms.

There are two ways of conducting a correspondence test: in 13 studies, the authors used the "single inquiries" procedure. In this type of correspondence test, each landlord or real estate agent receives only one inquiry from a randomly selected applicant. This type of test allows to avoid revealing the purpose of the experiment. However, this method does not control the effect of unobservable fixed variables on the response rate and therefore requires a much higher number of applications to obtain the same statistical significance than the matched procedure, used in 16 studies. In this latter, a number of applications (often two, but sometimes more) are sent to the same agent. Applications differ only by the variable of interest, here the ethnic group. This makes it possible to detect discrimination for a sole agent as well as between two agents. Like all "within" experiments, it is not necessary to have a sample as high as "between" experiments to have the same statistical power, but this can bring some bias, as for example here a risk of detection. From now on, we use the terms matched paired, triplet, quadruplet and quintuplet, when two, three, four and five applications are respectively sent to the same agent.

This literature is very widespread in **North America**, and particularly at the **USA**. In this country, five fields experiments have been performed over these last years.

During ten weeks in 2003, Carpusor and Loges (2006) were the first to perform a correspondence test in this market, replied to 1115 adverts for rental properties in Los Angeles by sending single inquiries in order to test discrimination towards African American and Arab/Muslim sounding names applicants. According to the results, African American and Arab/Muslim names received significantly fewer simple and positive responses than applicants with White-American sounding names. The response rate for these two minority ethnic groups is respectively 20 and 30% points lower than for White-American. Moreover, they did not find any differential treatment related to the type of agents: real estate agents discriminate as much as private landlords.

Between January and May 2009, Friedman et al. (2010) used a matched triplet procedure in order to test discrimination against Hispanic and African American groups in Dallas and Boston. In this first correspondence test studying discrimination against Hispanic people, almost one thousand and five hundred audits were carried out in total. By comparing simple response rates between ethnic groups, they find a significant discrimination only in Dallas. However, by comparing positive response rates, African American and Hispanic applicants are significantly less likely than White American to be invited

to inspect the unit in both cities, with a higher difference for African American. They did not highlight differential treatment by type of agents too.

Discrimination towards African-American applicants was also reported by Hanson and Hawley (2011). During three months in 2009, they sent almost ten thousand e-mail inquiries in matched paired procedure to landlord in the ten most major US cities. In addition to the ethnic background, the four fictitious applicants also differ by social class. This one was signaled in inquiries by syntax and more or less important financial stability. Across most cities of their sample, the response rate for African American sounding names applicants is 4–6% points lower than for White American. Discrimination is higher in neighborhoods near to 'tipping points' (when majority share is between 80% and 95%) and for units advertised as part of a larger building. Finally, authors find a presence of statistical discrimination: when the content of the e-mail inquiry insinuates applicant with high social class, ethnic discrimination is small and not significant.

Another large scale experiment was conducted at the same time by Ewens et al. (2014) and also provides evidence from discrimination against Black people in USA. By sending 14 000 single inquiries to private landlords in 34 major US cities between September and October 2009, they find a level of discrimination relatively close to Hanson and Hawley (2011): positive response rate for Black sounding names applicants is 9.3% points lower than for White when no signal inquiries were sent. However, even if providing positive information had a favorable impact on response rates for both groups, they showed that the racial gap widens in the switch from negative to positive signal, maybe suggesting that agents put more weight on signals provided by white than black candidates. It seems that women applicants received slightly more responses than men, but this result is not significant.

The latest correspondence test done in the United States was realized by Hanson and Santas (2014) between February and March 2011 in 21 major US cities. Like Friedman et al. (2010), they used written tests in order to study discrimination against Hispanic people. They designed different fictitious applications by separating candidates into three groups by names: White people, Hispanic, which appear to be assimilated into American culture, and Hispanic, which appear to be recent immigrants. By sending more than six thousand e-mails in matched paired procedure, they did not find significant evidence of discrimination against Hispanics with assimilated names while they highlight discrimination against non-assimilated names: they receive less favorable treatment with margins of net discrimination as large as more than 4% of landlords, reminding us the importance of name in correspondence tests. They even highlighted the fact that Hispanic with assimilated names receive significantly more responses than White applicants when the share of White residents in neighborhoods surrounding housing units is less than 28%.

According to these studies, it appears that discrimination against Hispanics is significantly lower than discrimination against Blacks in the US rental housing market.

Hogan and Berry (2011) have carried out between late March and early June 2007 the only experiment testing ethnic discrimination in the rental housing market in **Canada** by correspondence tests. They created ten fictitious groups of applicants: White, Black, Asian, Arab/Muslim and Jewish, varying by gender and sent more than five thousand email single inquiries to private landlords and real estate agents in Toronto. They highlighted a relatively high discrimination against Arab/Muslim men: their response rate is ten per cent points lower than for White men. They also find modest but significant discrimination against men with Asian and Black sounding names and against Arab/Muslim women.

Moreover, it seems that women tend to receive more responses than men (especially for Arab/Muslim and Asian applicants).

In all **Europe**, more than twenty field studies have been conducted recently.

The "oldest" experiments come from the Nordic countries, especially **Sweden**. In this country, four known studies using correspondence tests have been carried out.

The first experiment, done by Ahmed and Hammarstedt (2008) between February and March 2007 with the sending of one thousand and five hundred emails to private and corporate landlords in Stockholm, Gothenburg, and Malmö, and in non-metropolitan areas revealed the presence of both ethnic and gender discrimination in the Swedish rental housing market. They created three fictitious applicants: one Sweden male, one Sweden Female and one Arab/Muslim Male. Hence, they tested gender discrimination only on majority applicants and ethnic discrimination only on male applicants. Using matched paired procedure, results indicate that Arab/Muslim sounding names are more than half as likely to get a simple and positive response from agents than Swedish candidates and women applicants are almost twice as likely to be invited to showing apartment than men. This result is significantly more pronounced in metropolitan than in non-metropolitan areas. Moreover, it seems that real estate agents discriminate less Arab/Muslim candidates than private landlords and they do not discriminate male applicants.

The following year and at the same period, Ahmed et al. (2010) conducted another field experiment in Sweden. In order to study the impact of providing more information in applications sent to landlords and thus test the presence of statistical discrimination, they created four fictitious male applicants: one Swedish and one Arab/Muslim doing a simple request without any further information, and one Swedish and one Arab/Muslim providing detailed information about employment, education, marital status and income. They responded to a little over one thousand ads by single inquiries and still find a strong discrimination against Arab/Muslim applicants. Finally, adding more correct information about applicants do not reduce discrimination, suggesting that discrimination against Arab/Muslims in Sweden's rental housing market is based on preferences rather than lack of information.

Between March and May 2010, Bengtsson et al. (2012) tested gender and ethnic discrimination against male and Arab/Muslim applicants with high social status by sending more than one thousand and two hundred emails to private landlords in Stockholm. By testing the gender effect for minority applicants as well, they extend the study made by Ahmed and Hammarstedt (2008). They found gender discrimination especially on majority candidates and ethnic discrimination was only present in the suburbs of Stockholm. Interestingly, results do not confirm whether men with Arab/Muslim sounding names face discrimination.

During a six-months period from late 2010 to early 2011, Carlsson and Eriksson (2014) provided the latest field experiment in this country by sending to corporate or private landlords more than five thousand and eight hundred single inquiries in response to ads for apartments located all over Sweden. They conducted tests on ethnic, age, gender and employment status. Consistently with Ahmed and Hammarstedt (2008), Arab/Muslim sounding name applicants receive significantly fewer responses from agents than Swedish candidates and female applicants are more likely to be invited to visit the apartment than male applicants. Moreover, providing more positive information in applications does

not reduce the level of discrimination and the positive effect of having a job is larger if the landlord is a company. Finally, ethnic discrimination is mainly concentrated outside the metropolitan areas.

A very high level of discrimination against Arab/Muslim people has also been highlighted by Andersson et al. (2012) in **Norway**. Using single inquiries procedure, they tested discrimination related to status, gender and ethnic background in all over Norway between December 2009 to March 2010 by responding to 950 adverts for rental apartments. Arab/Muslim applicants are almost 13 percentage points less likely to receive a response than Norwegian applicants and women applicants tend to receive more responses from agent than men (statistically significant only for majority applicants). Moreover, it seems that providing positive information in inquiries has more impact for Arab/Muslim than for Norwegians, therefore reducing the gap between them, which is an indication that it is not only a matter of taste based discrimination.

Between September and October 2014, 1367 single inquiries emails were sent in all over **Denmark** by Herby and Nielsen (2015) in order to test discrimination related to status, gender, age and ethnic background. A significant discrimination against Arab-Muslim applicants has been detected. They are 8 per cent points less likely to receive a response than applicants with Danish names. Moreover, authors highlighted that men Arab/Muslim face more discrimination than women: 9% against 6%. Within ethnic groups, it seems that women received more responses than men (especially for minority applicants). As Andersson et al. (2012), providing positive information on applications increases the response rates for both ethnic groups, but significantly more for minority applicants, indicating that discrimination does not come only from the agents' preferences. Finally, and surprisingly enough, individuals aged 25 receive significantly more responses than individuals aged 45.

A strong level of discrimination against Arab/Muslim was also recently revealed by Öblom and Antfolk (2017) in **Finland**. By sending almost one thousand and five hundred inquiries in matched paired procedure during December 2015 and April 2016 to private landlords in Helsinki, Turku, Tampere and other selected locations around Finland, they showed evidence of both gender and ethnic prejudice. Arab/Muslim applicants are almost half as likely to get a positive response than Finnish applicants and Arab women are twice as likely to get a positive response than Arab men. This gender effect is significantly lower for majority applicants, thus authors have highlighted an interaction of ethnic and gender discrimination: gender discrimination is larger for Minority than Majority applicants.

The first study in **Iceland** has been carried out very recently by Kopsch et al. (2017), they directly and explicitly address discrimination against the largest minority group of labor-immigrants in Iceland: Polish people. Four fictitious applicants which differ by gender and ethnicity each applied to 127 apartments in the eight largest Icelandic cities. Results suggest that both ethnic and gender discrimination occur against Eastern European men in the Icelandic rental housing market: they receive significantly fewer responses from agents than men with Icelandic sounding names while Eastern European women are clearly favored compared to them. Finally, it seems that the gender effect is not significant for the ethnic majority.

Note that the discrimination against Arab/Muslim people in the Nordic countries is extremely high.

In **Western Europe**, this method began to popularize recently, especially in France and Germany.

In **France**, four studies exist and were conducted recently.

Acolin et al. (2016) sent 1800 single inquiries to landlords into 6 broad regions: Northwest France, Northeast France, Southeast France, Southwest France, Central and Western Paris, and Eastern Paris, during eight weeks in the spring of 2014 in order to detect discrimination towards five immigrant groups: Arab/Muslim, Sub-Saharan African, Turk, Eastern European, and Hispanic. They find that Eastern European and Hispanic groups are not discriminated while Arab/Muslim, Sub-Saharan African and Turkey are 16 to 22 percentage points less likely to receive a response than applicants with French names. Female Eastern European applicants would tend to receive more responses from agents than male applicants. The gender difference is not significant for the other ethnic groups.

Between October 2015 and February 2016, Bunel et al. (2016) tested discrimination against Kanaks in New Caledonia (collectivity of France) using a matched quadruplet procedure by sending 1368 mails in response to 342 real estate rental ads in the Greater Nouméa, the capital of New Caledonia. They find that Kanaks are 13 percentage points less likely to receive a response than applicants with European names. Moreover, Bunel et al. highlighted the presence of statistical discrimination against Kanaks: an employment stability signal significantly reduces the gap between Kanaks and European applicants by nine points (from 13 to 4). Finally, they showed that discrimination against Kanaks is higher with a private landlord than a professional.

Bunel et al. (2017) have used the same protocol in order to test discrimination in access to housing towards Arab/Muslim in Paris. Between April and May 2016, they sent 2016 messages in response to 504 rental ads. The results suggest that Arab/Muslim applicants are one-third less likely to receive a favorable response to their visit request than French sounding names applicants. However, this time, a signal of professional and financial stability strongly increases the chances of access to housing only for candidates of French origin, increasing the gap between fictitious applicants (from one-third to almost two-thirds). This result suggests a strong taste-based discrimination against Arab/Muslim candidates in Paris.

Finally, Le Gallo et al. (2017) have carried out the largest scale experiment in the world on access to rental housing by sending 25 040 applications in response to 5008 ads in the 50 largest French urban areas in order to detect discrimination towards Arab/Muslim and Sub-Saharan African in France[2]. Results indicate that applicants whose names is French-sounding, receive a response to 14% of their requests while Arab/Muslim and Sub-Saharan applicants receive respectively a response to only 10 % and 9.5% of their requests, either, in relative terms, almost a third less. They highlighted the presence of statistical discrimination: providing a signal of financial stability lessens discrimination (but does not erase it). Moreover, the testing does not reveal the existence of discrimination related to age (41 to 22 years old) and address (sensitive neighborhood or not). Finally, they showed that real estate agents significantly less discriminate minority applicants than private landlords.

Note that according to these studies, discrimination against Arab/Muslim and Sub-Saharan applicants is very high in France.

In **Germany**, three studies have been carried out over the last three years.

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[2] Some data of this article have not been inserted into the meta-database, so as not to add unnecessary heterogeneity. Indeed, two fictitious applicants clearly indicated in the mail that they currently lived in "rent-controlled housing" in a tense area while all the other fictitious profiles in the meta-database do not indicate their current place of residence.

Using matched paired procedure, Auspurg et al. (2017) tested ethnic discrimination against Turkish people in the Munich rental housing market between December 2006 and January 2008 by responding to 637 adverts for rental properties. They created fictitious applicants: German and Turkish males, which differ by varying occupations (low, medium, and high social status). They find that applicants with Turkish sounding names are 9 percentage points less likely to receive a response than applicants with German names, and providing a signal of high status significantly reduces the difference in treatment between Turkish and German applicants. This last result is only verified for real estate agents; it seems that private landlords tend to discriminate by ethnic background only (taste-based discrimination).

Mazziotta et al. (2015) conducted two investigations on discrimination based on ethnic and sexual orientation in twelve large German cities (six by study) in June 2013 and June 2014 responding by single inquiries to almost eight hundred adverts for rental properties. Four profiles of fictitious applicants were created: two German and two Turkish couples[3], varying by sexual orientation. They revealed evidence of discrimination only based on ethnic background.

More recently, two teams of data journalists (BR Data and Spiegel Online) have conducted a large-scale experiment in June and September 2016, sending around twenty thousand inquiries in response to almost seven thousand rental ads in the ten largest German cities to test discrimination against Arab/Muslim, Turkish, Italian and East European applicants. Using matched triplet procedure with applicants varying by ethnicity and gender, they first find that individuals belonging to minorities are discriminated in the rental housing market, more or less high depending on their ethnic background. Arab/Muslim and Turkish applicants are always the most discriminated (respectively 27 and 24 %), but discrimination against East European and Italian candidates remains significant (12 and 8 %). Moreover, in addition to ethnicity, gender also plays a significant role: authors highlighted an important gender effect between groups for Turkish and Arab/Muslim applicants: men with Turkish and Arab/Muslim sounding name are more disadvantaged compared to German men than Turkish/Arab/Muslim women are compared to German women. Even if the authors did not put it forward in this article, a gender effect within groups exists too: female applicants receive more responses from landlords than male applicants, for each group. Finally, private landlords discriminate against foreign applicants more strongly than real estate agents.

Thus, all studies conducted in Germany have reported a high degree of discrimination against Turkish applicants.

Between March and July 2010, Baldini and Federici (2011) sent more than 3676 single inquiries emails to private landlords or real estate agents in 41 cities of **Italy** in order to detect discrimination against Arab/Muslim and Eastern European applicants (varying by gender and socio-economic information). About three thousand e-mails were sent in correct form while the rest was ill formed on purpose[4]. Italian sounding names applicants receive the highest positive response rate from agents: 62% while Arab/Muslim applicants receive the lowest: 44%. E-mail inquiries signed by typical East-European sounding names show a lower level of discrimination than the Arab/Muslim ones (12% compared to 18%). Moreover, discrimination is higher against males than females sounding names applicants, in

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[3] Because of its protocol too different from other studies and in order to not create unnecessary additional heterogeneity, we chose not to include data from this article into meta-analyzes.

[4] We have only included the data related to mails written in correct form.

particular for the Arab/Muslim group and women had a higher probability of positive response than men, for any groups. They find that discrimination seems much higher in Northern than in Central or Southern Italy and they did not find any difference between private landlords and real estate agents behavior. Providing more correct information in the content of the e-mail inquiry slightly reduces the gap between minority and majority applicants, suggesting the presence of some statistical discrimination. Finally, grammatical errors in the content of the email do not seem to reduce the probability of receiving a positive response, for both the minority groups considered.

Two separates experiments were realized by Bosch et al. (2010, 2015) in **Spain** between January and March 2009 in 20 of the largest Spanish cities and between December 2009 and June 2010 in Madrid and Barcelona. Using different matched procedure in the first experiment in response to 1809 rental ads and sending 1186 single inquiries in the second, Bosch et al. tested the existence of discrimination against men and women with Arab/Muslim sounding names. In the first experiment, they investigated whether providing a greater amount of information on emails indicating a professional and financial stability increases the chances of access to housing (test for statistical discrimination) whilst they tested the existence of discrimination related to neighborhoods in the second. They found very similar results in both experiments: Arab/Muslim applicants face significant discrimination in the Spanish rental housing market, they are 15 to 18 percentage points less likely to receive a response than Spanish applicants. Results indicate the presence of statistical discrimination: providing positive information about the status of applicants significantly decreases the gap between majority and minority applicants. Moreover, real estate agents seem to discriminate significantly less than private individuals. In neighborhoods of Madrid and Barcelona, with a scarce presence of Arab/Muslim the response rate is 30 percentage points lower for Arab/Muslim sounding compared to Spanish applicants, while this differential decays towards zero as the share of Arab/Muslim increases. Finally, both studies indicate that Arab/Muslim women are favored compared to Arab/Muslim men.

In **Belgium**, Heylen and Van den Broeck (2016) focus on discrimination towards ethnicity, disability, gender combined with financial means (single mother) and only on financial means with written and phone approach. Almost seven hundred tests were conducted by telephone in matched paired procedure and almost 1800 single emails inquiries were sent to private landlords in the three Belgian region between February and May 2013. Regarding ethnic background, Arab/Turkey men are discriminated in both method and the level of discrimination is higher in the email approach (by five per cent point). Results confirmed discrimination based on disability, gender combined with financial means, and on financial means too, and these results are always more pronounced with email approach. "Possibly, landlords feel more comfortable when they can discriminate by email than by phone, where a direct contact takes place with the person". They also tested simple gender discrimination but only in the telephone approach and thus find that Arab/Turkey men receive significantly less invitation to see the apartment compared to Arab/Turkey women.

In order to test discrimination toward similar characteristics with other ethnic groups, a large scale experiment was conducted more than three years later by Verhaeghe et al. (2017) in Brussels Capital Region by means of correspondence tests and in-person tests conducted over the phone. More than 20 000 messages were sent to real estate agents and 1.542 successful calls were made by phone in matched paired procedure, allowing to find results consistent with Heylen and Van den Broeck (2016). Results of the written approach indicate that Eastern European applicants are not discriminated while men with Sub-Saharan African and Arab/Muslim sounding names are 21 to 23 per cent less likely to

receive a response than men with Belgian names. Arab Muslim women faced significantly less discrimination than men while there is no difference for Sub-Saharan applicants. Once again, authors find that real estate agents are more likely to discriminate in the case of written applications than by telephone.

In **Eastern Europe** however, only two field studies have been completed.

Between December 2009 and August 2010, Bartoš et al. (2016) responded to 1800 rental ads mostly distributed in Prague by single inquiries procedure in order to test discrimination against Roma and Asian minorities in the rental housing market in the **Czech Republic**. Applicants with minority-sounding names face strong discrimination: they are almost half as likely to get a positive response as those belonging to the majority. Moreover, authors find a presence of statistical discrimination: providing more correct information in the content of the e-mail inquiry reduces the gap between minority and majority applicants.

In all **Slovakia**, Sacherová (2016) sent almost 400 e-mail requests in matched paired procedure to private and real estate agents between November 2015 to January 2016 in order to test discrimination against Roma in the sale and rental housing market[5]. Results indicate that Roma sounding names applicants are 8 to 10 percentage less likely to receive a positive response than applicants with Slovak names. Moreover, the rates of positive responses to applications for rental offers is on average 16 to 23% lower than in case of ads for sale.

Finally, in **Israel**, one study indirectly investigated ethnic discrimination in the rental housing market by correspondence tests approach. Sansani (2017) studied discrimination against the religiously observant in the Israeli rental market, but to get a sense of the magnitude of the discrimination against religious relative to discrimination based on other characteristics, such as ethnic background, he also tested discrimination against individuals with Arab and Eastern European sounding names. Four male fictitious groups were created: Jew signaling religion, Jew with no signal, Arab and Eastern European sounding name applicants[6]. More than 1800 single inquiries were sent to private landlords in the most major cities in Israel. A significant discrimination against applicants reporting their religion was found: Jews reporting religion receive almost ten per cent percentage points less responses than Jews with no signal. Discrimination against ethnic minorities was also very high: East European sounding names faced similar discrimination than Jews religious applicants while Arab candidates are more than half as likely to get a response than non-religious Jews candidates.

Method and data

As all of these correspondence tests are conducted in a very similar way, we used meta-analysis to provide a quantitative summary of the existing literature in a systematic manner. In order to increase comparability, we decided to exclude calls audit and personal approaches and focus instead on the correspondence tests carried out in OECD countries only on the rental housing market.

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[5] We have taken the data concerning rental housing market only.
[6] We did not take into account the profile "Jews signaling religion" in the meta-analysis, in order to compare only the ethnic background and not to add a religion character.

Indeed, we chose this method as it is the most commonly used over the past few years, targeting countries with similar development level, lifestyle standards, same type of democratic governance and close market economy. Excluding correspondence tests in the shared housing (e.g Carlsson, Eriksson, 2015, Diehl and Al., 2013, Ghoshal, Gaddis, 2015…) makes sense to us given that it would require to take into account the decision of the landlord to share his home or not, which is too different from the concept of the standard tenancy.

To search for the data, we used *Google scholar*, Econlit, *ScienceDirect of Elsevier*, with the following keywords: "discrimination", "housing", "rental housing", "correspondence test", "ethnic discrimination", "field experiment". We also relied on the review conducted by Rich (2014) or Oh and Yinger (2015) and attended seminars. Finally, we also included data from the project DALTON (France) in which we participated[7].

We included data from 25 studies, covering 14 countries: France (Acolin et al., 2016, Bunel et al., 2017, Bunel et al. 2016, Le Gallo et al., 2017), Canada (Hogan, Berry, 2011), Czech Republic (Bartoš et al., 2016), Slovakia (Sacherová, 2016), Finland (Öblom and Antfolk, 2017), Denmark (Herby and Nielsen, 2015), Germany (Auspurg et al., 2017, Team BR Data and Spiegel Online, 2017), Italy (Baldini and Federici, 2011), Norway (Andersson et al., 2012), Spain (Bosch et al., 2010, Bosch et al., 2015), Sweden (Ahmed et al., 2010, Ahmed and Hammarstedt, 2008, Carlsson and Eriksson, 2013), Iceland (Björnsson et al., 2017), Israel (Sansani, 2017) and finally USA (Carpusor and Loges, 2006, Ewens et al., 2014, Friedman et al., 2010, Hanson and Hawley, 2011, Hanson and Santas, 2014), which are countries very similar in terms of development, whether human or economic.

We could not get enough data to integrate Heylen and Van den Broeck (2016), Verhaeghe et al. (2017), and Bengtsson et al. (2012) into the meta-analysis[8]. For most analyzes, almost every study can be divided into several subgroups, depending on the concerned ethnic group, gender, information provided in applications, procedure used by the experimenter to carry out the correspondence test, etc. As decisions have been taken by different private landlords or real estate agents and are therefore not very likely to influence each other, each subgroup can be treated to some extent as an independent experiment. Our main variable of interest is the origin/ethnicity, but subgroups also allow us to evaluate discrimination by gender, type of landlord, type of response, type of information provided into the applications, type of procedure…

Note that the type of apartment tested in these correspondence tests was very similar in the different studies and the corresponding rent accounted for a similar share of median net income of individuals (around 50%), so we could not test the discrimination according to the type of flat, which is one of the methods to test statistical discrimination[9]. However, this allows a better homogeneity of the database.

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[7] http://www.agence-nationale-recherche.fr/projet-anr/?tx_lwmsuivibilan_pi2%5BCODE%5D=ANR-15-CE28-0004.

[8] The response rates for the baseline (majority men) are not provided and we are not able to calculate them with information provided.

[9] We hypothesized that if real estate agents or landlords do not have sufficient information on minority applicants, and consider foreign ethnicity as a proxy for a lower income (due to higher unemployment), they may avoid spending time on answering applications from applicants they perceive as being poorer than others, so they should discriminate more minority applicants when the rental price is high.

We were able, from these studies, to obtained data on ten minority groups: African, Arab/Muslim, Asian, East European, Hispanic, Italian, Jewish, Kanak, Roma and Turkish.

Each of these authors has its very own way to report the results: in terms of net discrimination rates, risk ratios, odds ratios... Unfortunately, there is no existing standard on this subject. To clarify, we present the results of meta-analyzes on the same basis, in terms of *absolute discrimination*, through odds Ratio, which is the ratio of two odds: the odd of getting a response for the *minority group* over the odd of getting a response for the *majority group*. Put differently, it is the probability of being chosen/favored for an individual belonging to the minority group over the probability of being chosen by a majority applicant.

For example: If only 5% of the minority applicants and 10% of the majority applicants received a response by an agent, we compute the odds as following: 0.05/0.95 is the odd for minority applicants (share of individuals for whom the event occurs divided by the share of individuals for whom it does not occur) and 0.1/0.9 is the odd for majority applicants. Thus the odds ratio is 0.47: minority applicants have 53% lower odds to receive a response by a private landlord or a real estate agent, compared to majority candidates. A majority applicant in this case is slightly more than twice as likely to be chosen by a real estate agent or a private landlord than a minority applicant.

The odds ratio is therefore another way of calculating the risks, yet a bit less intuitive than simple risk ratio at first glance but we follow Borenstein et al. (2009): "Many people find this effect size measure less intuitive than the risk ratio, but the odds ratio has statistical properties that often make it the best choice for a meta-analysis".

Note however that we reach similar conclusions with Risk Ratios.

Consideration of publication bias

Studies that show significant results are much more likely to be published than studies showing negative results (not significant). Publishing results only showing a significant discovery disrupts the balance of results.

The most obvious way to avoid this publication bias is to try to find as many studies as possible having used correspondence tests in order to determine if there is discrimination in housing market but have not been published. To do this, we analyzed posters or some congress abstracts and we participated on seminars on the topic. We were able to find a large number of unpublished studies. We note however that they also report high discrimination.

The statistical evaluation of the existence of publication bias can be implemented in different ways. The most common one is through the realization of a Funnel-plot (a graph in the form of an inverted funnel). This type of graph shows, according to the precision of studies (or the sampling size) on the y-axis on the one hand, and the effect size on the x-axis on the other hand, that some publications seem to be missing: the distribution of the dots is not homogeneous around the true value, not filling an image of an inverted funnel. However, this simple method is not powerful enough to determine with certainty whether a publication bias is present. Indeed, for example, the heterogeneity observed between studies can be another explanation for a possible funnel plot asymmetry. Moreover, a limited number of studies do not allow this test to detect a publication bias (Egger et al., 1997). Statistical tests

have been performed to provide further assessment of publication bias that inspection of funnel diagrams does. The most famous is the Egger's test.

When we present our results in term of Odds Ratio, we get a funnel plot relatively asymmetrical (see Figure 1.3 in the appendix). In the absence of heterogeneity (or publication bias), 95% of the studies should lie within the funnel defined by the straight lines. Statistical heterogeneity refers to differences between study results beyond those attributable to chance. The relative asymmetry of the funnel plot (checked with the egger test: z = -2.9393, p = 0.0033) suggests that there are some missing studies, reporting even more discrimination than the average.

The "trim and fill" method (Duval and Tweedie, 2000) is a possible « correction » process if a significant publication bias is observed: the results of the « missing » studies in the mirror image are calculated as being strictly opposite to those of the identified studies. Adding these fictitious missing studies enables to obtain a new summation of results. Using this method, we find that no study is missing on the right side of the funnel plot but there are three studies missing on the left side, suggesting that even greater ethnic discrimination exists in the rental housing market on OECD countries[10].

However, whether the bias is corrected or not, main results are of the same order of magnitude (see figure 1.4 in the Appendix). So, as results report after correcting bias are very similar and as we cannot affirm the presence of a publication bias, we choose to present results without correction.

Even if random effects (R-E) does seem to be the most indicated method in this case, we have also detailed the results of the MRA with unrestricted weighted least squares (WLS) method (Stanley and Doucouliagos, 2015, 2017), which is a more suitable method in case of publication bias. We have also detailed the results with the fixed effects (F-E) model. The effects sizes found with these three models are very similar and lead us to the same conclusions.

Meta-analysis Results

First, we present the overall results of a meta-analysis that takes into account the discrimination reported in all studies. To present the overall results, we use a random effect model[11], as it seems reasonable enough to assume that the real effect size is not exactly the same for every study (presence of between-studies heterogeneity).

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[10] If we report results for gender discrimination only, the "trim and fill" method does not detect any missing studies and the funnel plot is symmetrical (egger test: z = 0.0201, p = 0.9840)

[11] Our conclusions with a fixed-effect model are in the same line, but as this model assumes that all studies share the same real variable of interest, it places far too much emphasis on the three studies with the largest sample size, and almost ignores the others. Yet these latter studies, although having a smaller sample, capture an effect that these three large studies do not.

1) Ethnic and Racial discrimination

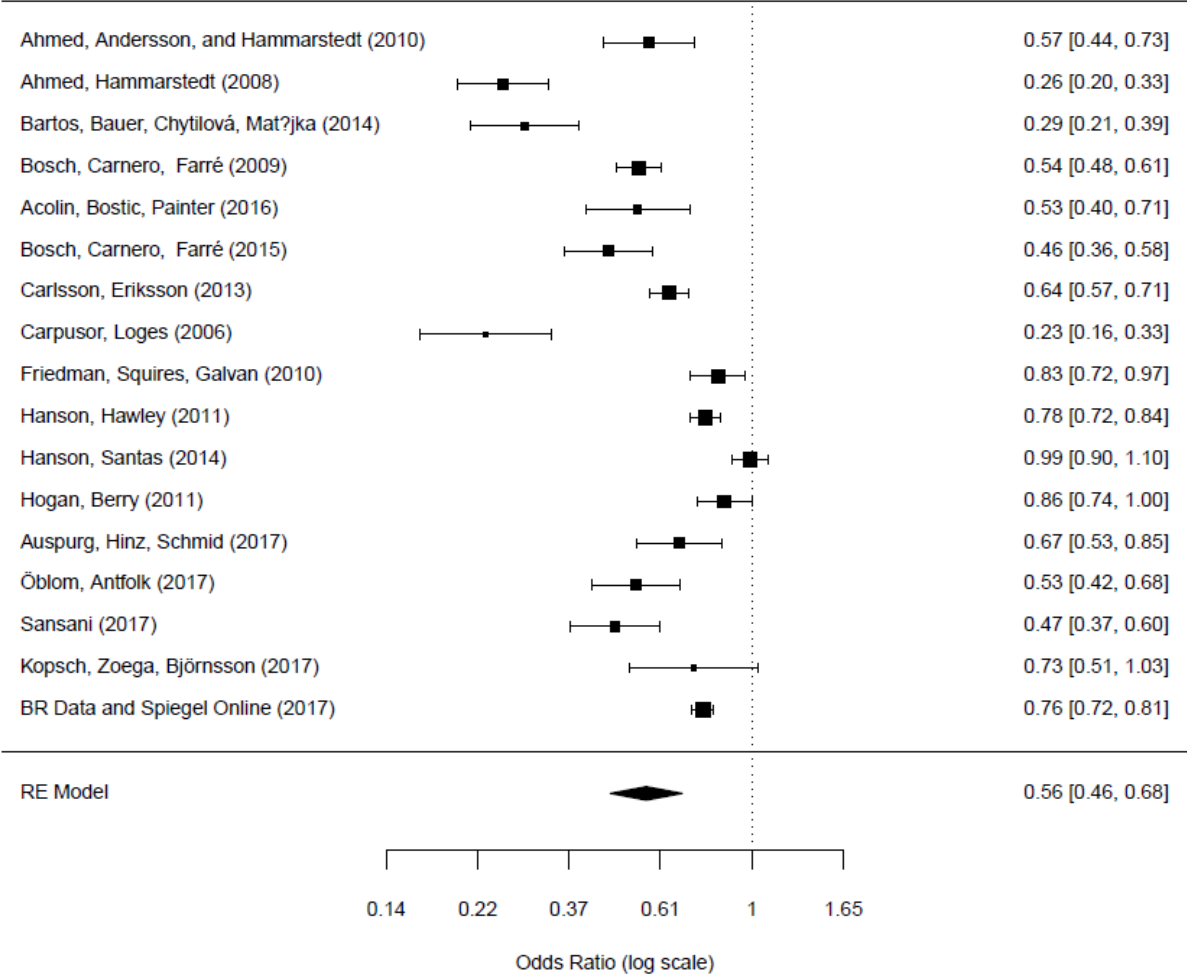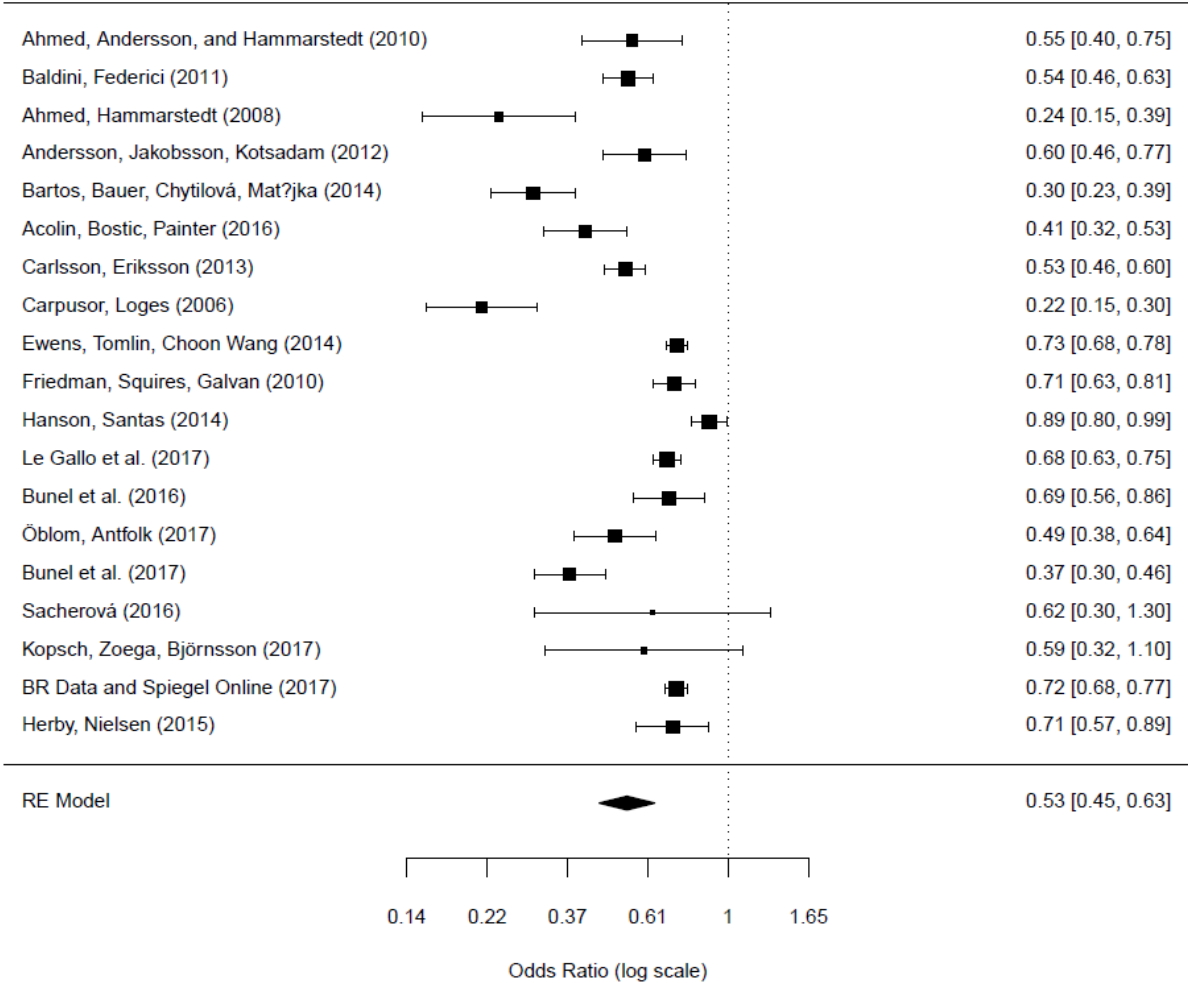Figure 1: Ethnic and Racial Discrimination in Rental Decisions
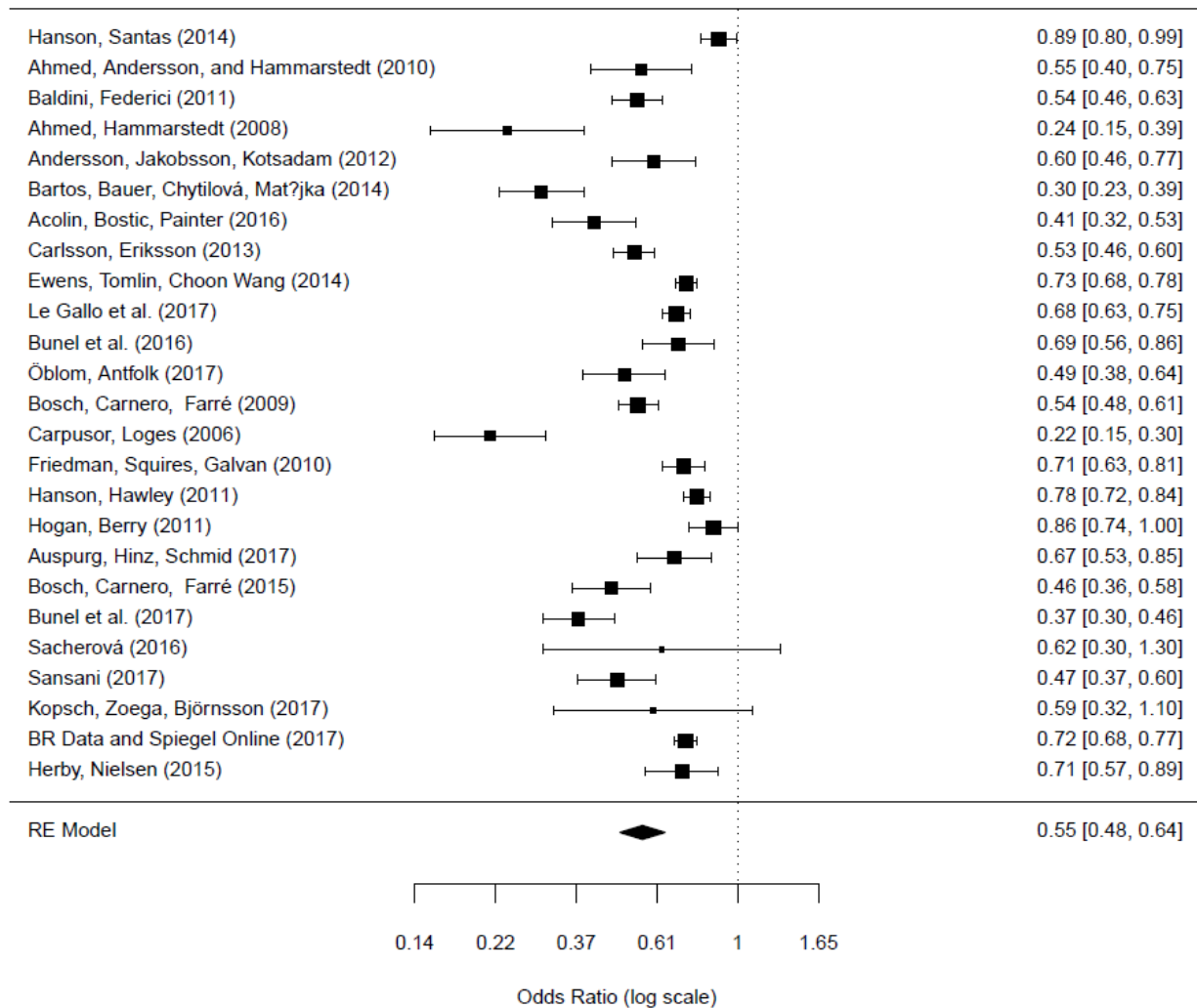
Note: *This forest plot (figure 1) displays the odds ratios in log scale of each study (point estimate as square, two standard errors as lines). At the bottom, the lozenge indicates the effect size across studies (N = 25: study level).*

The odds ratio is 0.55: minority applicants have 45% lower odds to receive a response by a private landlord or a real estate agent, at equal information provided in applications, compared to majority candidate. Each study includes a number of subgroups, and, in order to gain robustness, we can use them to do this global meta-analysis. We find at this level an odds ratio of 0.57 (*N* = 268: level of subgroups), which is the same order of magnitude. Thus, a majority candidate is almost twice as likely to be favored than a minority candidate in OECD countries. There exists a large Ethnicity-based discrimination in housing market in OECD countries. Interestingly, our results are close to those of Zschirnt and Ruedin (2016) related to hiring decisions in labor market. As often done in the literature (e.g. Bartoš et al., 2016), we can separate responses provided by private landlords or real estate agents into two categories: the "simple response", that results in a contact, regardless of whether it is a positive or a negative response and the "positive response", meaning that the landlord or real estate agent requested further information or directly invited the applicant to a showing. Thus "positive response" is a subgroup of "simple response", but, as some studies have reported only one type of

responses and as these different types of responses do not represent the same thing, it is maybe rather wise not to mix corresponding odd-ratio. Indeed, despite its practicality, comparing *simple response* rates may not be the best way to determine discrimination and might tend to underestimate it, "to the extent that majority rates could include more positive responses than minority rates" (Ewens et al., 2014). Fortunately, our database has more *positive responses* ratios than simple ones because it seems to become the norm in this literature despite the fact that it is easier for authors to record *simple response* rates for each ethnic group than *positive response* rates that require large sorting. Some of these authors even reported the rate at which the landlord invited the applicant to a showing without any further inquiries, which is even more accurate (but requires even more tedious sorting).

Thus, we present a meta-analysis of each type of response provided by real estate agent or private landlords in order to determine if the type of responses has an impact of the level of discrimination. We show in Figure 1.1 the level of discrimination reported by "simple response".

Figure 1.1: Ethnic and Racial Discrimination in Rental Decisions (Simple response)

Note: This forest plot (figure 1.1) displays the odds ratios in log scale of each study (point estimate as square, two standard errors as lines) by simple response. At the bottom, the lozenge indicates the effect size across studies (N = 17: study level).

We can see that the effect size is 0.56 at study level (*N* = 17): minority applicants have 44% lower odds to receive a response by a private landlord or a real estate agent, compared to majority candidate. We

find at level of subgroups an odds ratio of 0.62 (*N* = 109: level of subgroups), which is similar to the result in study level. Thus, a majority candidate is almost twice as likely to be favored than a minority candidate in OECD countries.

Finally, Figure 1.2, which is also a forest plot, presents the results of all studies composed of positive responses rates.

Figure 1.2: Ethnic and Racial Discrimination in Rental Decisions (Positive response)

Note: This forest plot (figure 1.2) displays the odds ratios in log scale of each study (point estimate as square, two standard errors as lines) by positive response. At the bottom, the lozenge indicates the effect size across studies (N = 19: study level).
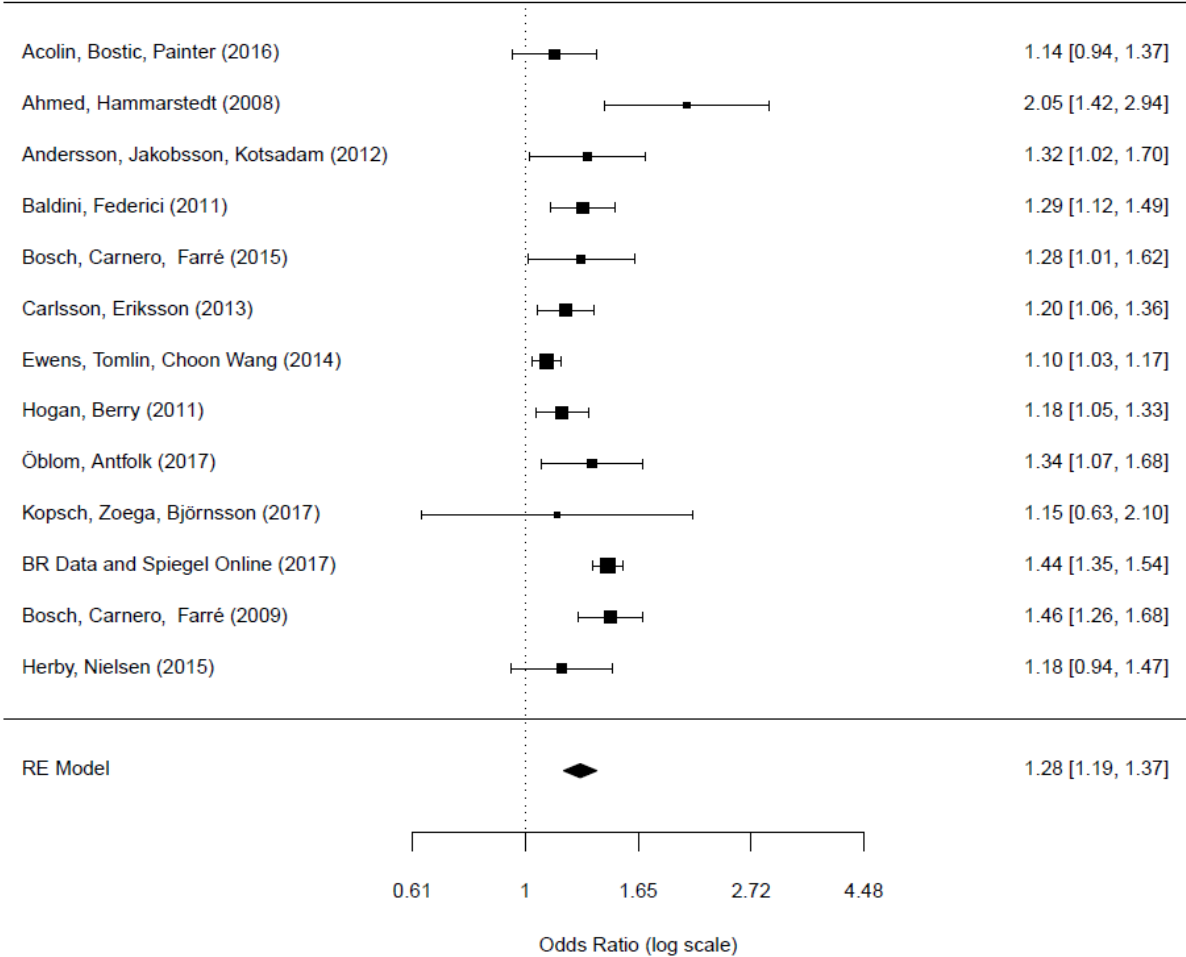
The effect size across studies noted by *positive responses* is 0.53: minority applicants have 47% lower odds to receive a positive response or be requested further inquiries by a private landlord or a real estate agent, compared to majority candidate. At subgroups level (*N* = 159), the odds ratio is 0.55, around the same order of magnitude. Hence, a majority applicant has almost twice as likely to be chosen by real estate agents or private landlords than a minority applicant in OECD countries. It seems that the type of response has a small negative impact on the level of discrimination, suggesting the presence of positive response is a little higher in *simple responses* majority rates than in minority rates.

We now choose to focus our meta-analysis on only one minority: the Arab/Muslim group, for which we have a lot of data and we know it is a minority facing a wide discrimination. First, we present the results of a meta-analysis that takes into account the discrimination reported in all studies against Arab/Muslim.

Figure 2: Discrimination against Arab/Muslim in Rental Decisions
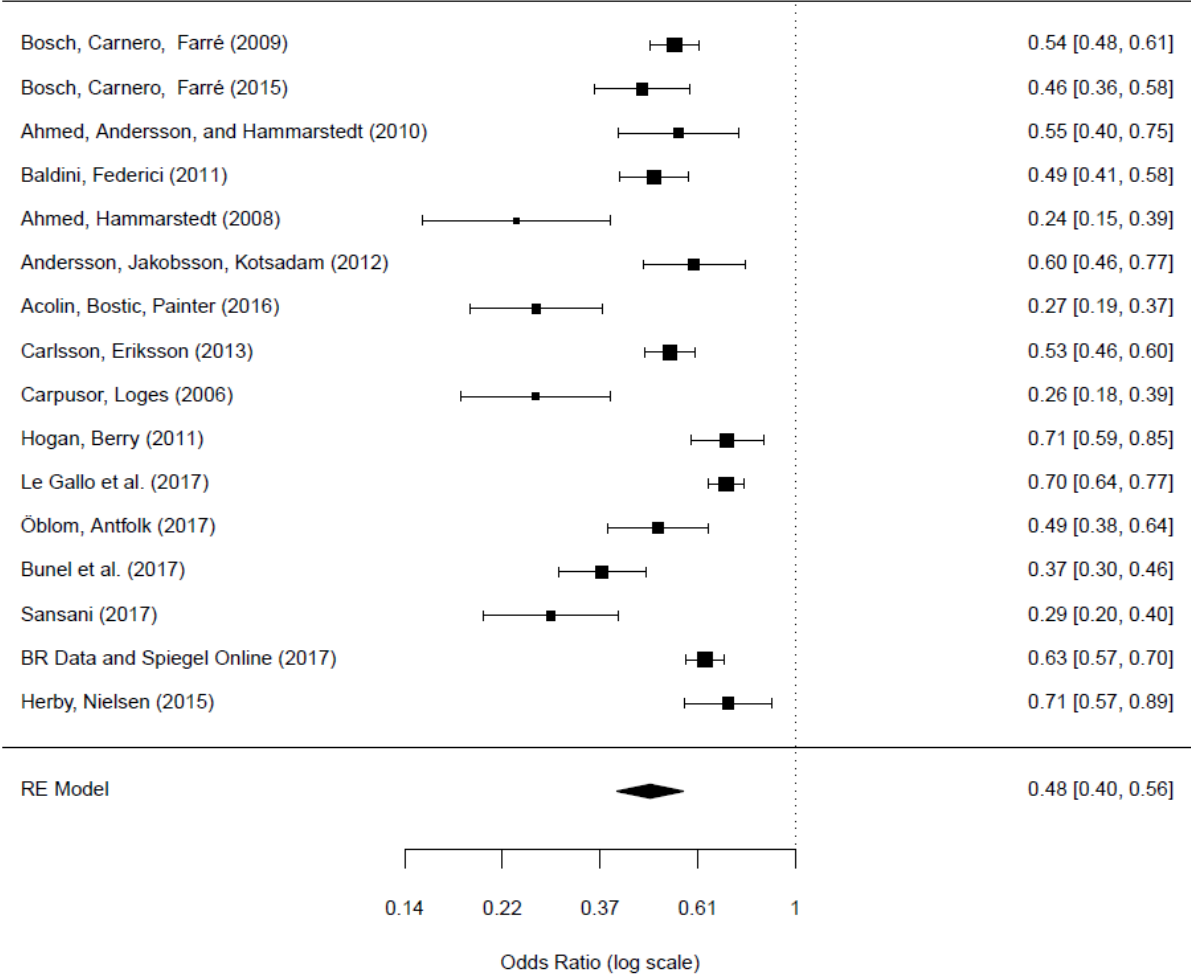
Note: This forest plot (figure 2) displays the odds ratios in log scale of each study deferring discrimination against Arab-Muslims (point estimate as square, two standard errors as lines). At the bottom, the lozenge indicates the effect size across studies (N = 16: study level).

The effect size across studies is 0.48: Arab/Muslim applicants have 52% lower odds to receive a response by a private landlord or a real estate agent, compared to majority candidate. The odds ratio is 0.52 at level of subgroups (*N* = 119). Individuals belonging to the majority are twice as likely to be favored by private landlord or real estate agent than Arab/Muslim in OECD countries. We have also carried out meta-analyses with simple responses rates and positive responses rates. The corresponding forest plots are presented in the Appendix (figure 2.1 and figure 2.2). The effect size across studies noted by the *simple responses Meta-analysis* is 0.48 (*N* = 11: study level, confidence interval: [0.39: 0.59]): Arab/Muslim applicants have 52% lower odds to receive a response by a private landlord or a real estate agent, compared to majority candidate. At subgroups level (*N* = 40), the odds ratio is 0.52. Finally, the effect size across studies noted by *the positive responses Meta-analysis* is 0.47

(*N* = 12: study level, confidence interval: [0.38: 0.58]): Arab/Muslim applicants have 53% lower odds to receive a positive response by a private landlord or a real estate agent, compared to majority candidate (Subgroups level: *N* = 79, odds ratio = 0.52). Thus, majority candidates are more than twice more likely to be chosen than Arab/Muslim in OECD countries.

2) Gender Discrimination

In 13 out of 25 studies, the authors also listed the results by gender of applicants. Gender discrimination is always associated with ethnic discrimination in housing: to our knowledge, there is no correspondence test that has been made only to study the effect of gender in the housing market and we are the only ones presenting a quantitative analysis on gender discrimination in the housing market on OECD countries. We still present the results in term of Odds Ratio, the ratio of two odds: the odd of getting a response for the *Female group* on the odd of getting a response for the *Male group.*

Figure 3: Gender Discrimination in Rental Decisions

Note: This forest plot (figure 3) displays the odds ratios between male and female applicants (in log scale) of each study (point estimate as square, two standard errors as lines). At the bottom, the lozenge indicates the effect size across studies (N = 13: study level).

The odds ratio is 1.28: Female applicants have 28% higher odds to receive a response by a private landlord or a real estate agent, compared to Male candidates. The result at subgroups level (N = 65) is 1.30. Therefore, some Gender-based discrimination is apparent in the housing market in OECD countries, male names would receive fewer response than female names.

Is this gender effect different between majority and minority applicants?

If we analyze the results by group of applicants, the results are not the same; Figure 3.1 presents the results by majority applicants and Figure 3.2 shows the results by minority applicants.

Figure 3.1: Gender Discrimination in Rental Decisions (majority applicants)
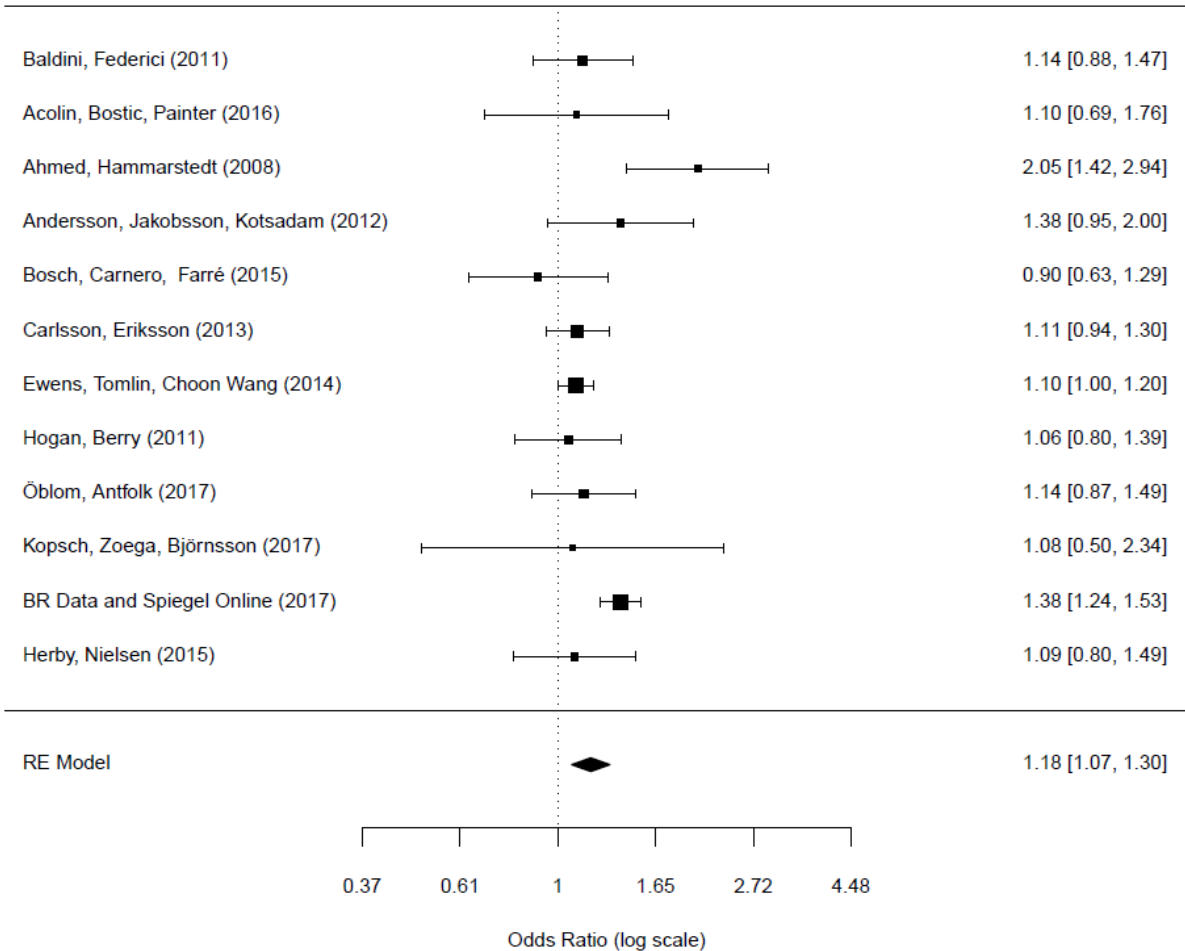
Note: This forest plot (figure 3.1) displays the odds ratios between male and female majority applicants (in log scale) of each study (point estimate as square, two standard errors as lines). At the bottom, the lozenge indicates the effect size across studies (N = 12: study level).

We can easily see in this forest plot that the gender effect is smaller for individuals belonging to the majority. The effect size across studies is only 1.18: Female majority applicants have 18% higher odds to be favored by agents, compared to Male candidates. At subgroups level (N = 23), the odds ratio is 1.22, around the same order of magnitude.

For minority applicants, the gender effect is much more striking (Figure 3.2), the odds ratio is 1.34 at study level (N = 12), and 1.35 at subgroups level (N = 42), which implies that Female minority applicants

are more than 30% more likely than male applicants to be chosen. Moreover, if we concentrate our analysis on only Arab/Muslim applicants, this gender effect is even higher: 50% (see Figure 3.3 in Appendix): odds ratio is 1.48 at study level (*N* = 10) and 1.47 at subgroups level (*N* = 18). Separating analysis by identity groups allows us to show that there is an interaction of ethnic and gender discrimination: gender discrimination is larger for Minority-sounding names than for Majority-sounding names.

Thus, Female majority sounding names are the most favored, while Male minority names are the least often chosen (especially Arab/Muslim Male). Foreign women would be in the collective imagination more trustworthy than a foreign man, who is often associated with a more suspicious person, and maybe in extreme case with a terrorist for Arab/Muslim people.

Figure 3.2: Gender Discrimination in Rental Decisions (minority applicants)
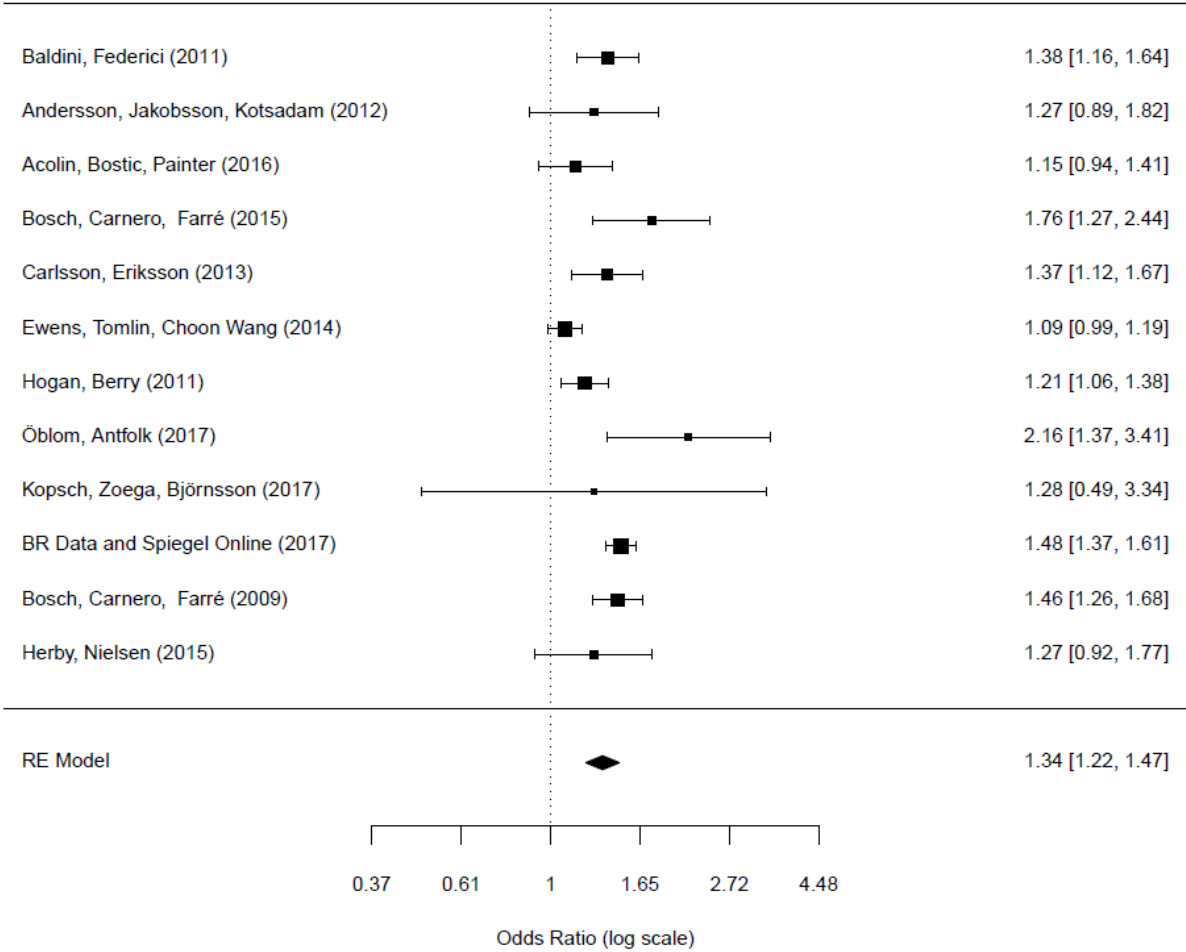
Note: This forest plot (figure 3.2) displays the odds ratios between male and female minority applicants (in log scale) of each study (point estimate as square, two standard errors as lines). At the bottom, the lozenge indicates the effect size across studies (N = 12: study level).

3) Statistical discrimination or prejudice?

In order to fight this discrimination, it is essential to know its origins. Indeed, as mentioned before, this discrimination can be preference-based or statistical. In the literature, a very common method to test

the source of discrimination consists in comparing the level of discrimination between majority and minority applicants when no information had been sent to the agents except the names of applicants with the level of discrimination when detailed information had been sent to agents. "Detailed information" indicates that the applications sent to real estate agents or private landlords provided positive information about, among other things, employment, education, and marital status of the applicant, involving a certain stable situation[12]. Therefore, this allows to study whether discrimination against applicants can be reduced by increasing the information given about them.

We assume that providing more correct information about the candidates should not affect the level of discrimination against minorities if discrimination is taste-based, but it should reduce the discrimination against minorities if some of the discrimination is statistical. In other words, if the positive effect of the information on the response rates is stronger on the individuals belonging to the minority than to majority applicants, then some of the discrimination is statistical, otherwise discrimination is preference-based.

In ten studies, the authors tested the presence of statistical discrimination by this method.

We present the first quantitative analysis of statistical discrimination in the housing market on OECD countries through meta-analysis. Once again, we present the results in term of Odds Ratio, the ratio of two odds: the odd of getting a response for the *Detailed information group* on the odd of getting a response for the *No information group.* Results are report in Figure 4.1 for majority applicants and Figure 4.2 for minority applicants in the Appendix.

Our findings suggest that providing more correct information in the applications increases the probability of being chosen for both minority and majority applicants by almost 40% (respectively 37 and 39%)[13]. Therefore, the effect of information is of the same order of magnitude for both ethnic groups and it seems that more correct information would not tend to reduce the gap between majority and minority applicants. In the majority of cases, providing more information slightly reduces discrimination, but in two cases, this greatly increases discrimination. Thus we cannot provide evidence that significant statistical discrimination is at work on OECD countries. Thereby, it seems that discrimination mainly comes from preferences.

Meta-regression analysis

In this section, we present a multivariate regression analysis in order to examine the determinants of the level of discrimination (in log odds ratio) with three econometric models: Fixed-effects (F-E), unrestricted Weighted least squares (WLS), and Random effects (R-E). Meta-analysis focuses on the value of the variable of interest while meta-regression focuses on the variables that influence this variable.

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[12] Consider examples of emails sent to test statistical discrimination (Bosch et al., 2010): "No-information" applicant: "Hello, I am interested in renting this apartment. I would be very grateful if you contacted me. Thank you. NAME" or alternatively "High-quality" applicant: "Hello, I am interested in this flat. I work for an important commercial bank. I have recently moved to (city) and I am looking for a flat where to live for at least a couple of years. I would be happy to provide a financial guarantee. Please contact me if interested. Many thanks. NAME"
[13] Recall that the information provided by the two ethnic groups are exactly the same because it comes from the same studies.

We now present all the explanatory variables that we have chosen to use for our regression and explain the way in which we code variables.

Explanatory variables

The coding of variables is a crucial issue. It allows the transformation of different characters identified in the literature into testable elements. However, this procedure is not without problems, the main one being the loss of information. This occurs when literature only reported data on key determinants (e.g. data sources, study samples, econometric techniques). However, as we have been able in our case to report response rates for almost every type of applications[14], we did not need to do a lot of transformation of different characters into testable elements.

Indeed, because of the control that correspondence test method brings, most elements were already well coded in the primary literature and were directly testable without the need for transformation. We only made one real transformation, and this concerns the first variable, *Company*.

We separated the variables into three broad categories: type of renter, characteristics of the e-mails sent and characteristics of the applicant.

Company is a dummy variable which takes the value "1" when the applications have been sent to real estate agents while it takes the value "0" if applications have been sent to private landlords. However, only eight studies reported response rates by type of agent. Nonetheless, most studies have reported the proportion of each type of agent in the experiment. Therefore, we chose, when the separate response rates have not been reported, to code these variables as follows: when the proportion of real estate agents was greater than the proportion of private landlord in a study, we coded this latter as "Company", and conversely, when the proportion of real estate agents was lower than the proportion of private landlord, we coded this study as "private landlord".

As we said before, there are two ways of conducting a correspondence test: in 11 studies, the authors used the *single inquiries* procedure while the *matched* procedure was used in 14 studies. We chose *single inquiries* procedure as a reference.

We clustered the countries of the database by continents, using a dummy variable to distinguish between applications sent in North America or in Europe[15] (reference).

Meta-analysis allows to determine the overall effect of information on applicants, but meta-regression allows us to test this effect in different contexts. Once again, *Detailed information* indicate that the applications sent to real estate agents or private landlords provided positive information about employment, education, marital status of the applicant, involving a certain stable situation. Our reference is *no information*, which indicates that no information had been sent to the agents except the name of applicants. So, this allows studying whether discrimination against applicants can be reduced by increasing the information given about them.

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[14] Although we have reported the results by age and geographical environment whenever possible, we do not have enough data to include it in the meta-analysis.
[15] For more practicability, Israel is coded as "Europe".

Female minority is a dummy variable which takes the value « 1 » if the minority applicant is a woman and "0" when the minority applicant is a man (reference).

Female majority is a dummy variable which takes the value « 1 » if the majority applicant is a woman and "0" when the majority applicant is a man (reference).

The last variable is ethnicity and we took as a reference the Arab/Muslim group.

Our baseline model for the MRA is specified as follows:

$$y_j = \beta_0 + \beta_1 x_{1j} + \beta_2 x_{2j} + \cdots + \varepsilon_j$$

where y_j is the odds ratio (in log) on the correspondence test (a subgroup of a study) j and β_0 is the intercept. The variables x_i specify different characteristics of the correspondence test, like detailed information provided in the applications, type of agents, gender of applicants… ε_j in this baseline model specifies the between subgroup variation.

Several methods can be used to estimate this model:

A fixed effect (FE) estimator assumes that all subgroups share the same real effect size. Because of possible unobserved protocol differences and unobserved differences in population tested in these correspondence tests, we must be very careful of results interpretation. This type of estimator allows for within-subgroup variability but ignores between subgroup variation. As a result, parameter estimates are biased if between subgroup variation cannot be ignored.

On the other hand, the random effects (RE) estimator allows the real variables of interest to vary from one subgroup to the other but this method may be sensitive to possible publication bias.

Finally, Stanley and Doucouliagos (2015, 2017) propose to estimate the baseline model using an unrestricted least squares (WLS) model, which consists in estimating this equation using weighted least squares with $1/se^2(y_j)$ (where se is the standard error of log odds ratio) as the weights. When there is publication selection bias, the WLS-MRA estimates always have a smaller bias than random effects estimates (Stanley and Doucouliagos, 2015, 2017).

For purpose of completeness, we also follow Stanley and Doucouliagos (2012), by clustering standard errors at the study level in all specifications, to make them robust to intra-study dependence. Clustering does not affect the estimated coefficients, only their significativity in a more conservative way.

Moreover, we pay great attention to multicollinearity problems in our regressions because a meta-regression analysis is more prone to multicollinearity than classical econometrics. Indeed, most explanatory variables are dummies. In our case, all of explanatory variables present a variance inflation factor (VIF) less than 3. Small VIF values indicate low correlation among variables. A value of 10 (or sometimes 5) is limit value commonly used in the literature (Hair et al., 1998).

We have only taken into account in this meta-regression the subgroups where all information was provided (detail of information in the mail is specified, gender is specified, type of landlord is specified…). As *positive response* is a subgroup of *simple response,* we take into account only *positive*

response into the meta-regression to avoid using the same data multiple times and also because *positive response* is a better estimator of discrimination.

Unfortunately, we do not have enough data to calculate the correct effect of certain ethnic variables. Descriptive statistics of variables used in the MRA are provided in Table 1.

Table 1: Descriptive statistics of variables used in the MRA (Odds ratios minority against majority)

Variable	Dummy	Frequency=1	Frequency=0
Matched	1 if matched procedure	51	56
Real Estate	1 if Real Estate	30	77
Detailed information	1 if detailed information	42	65
Female Minority	1 if Female	46	71
Female Majority	1 if Female	47	70
North America	1 if North America	8	99
African	1 if African	10	49
East European	1 if East European	20	49
Hispanic	1 if Hispanic	9	49
Turkish	1 if Turkish	8	49

Results are reported in Table 2. Positive values indicate a lower level of discrimination between ethnic majority and minority applicants and negative values denote a higher level of discrimination between ethnic majority and minority applicants.

For instance, the positive value for "Female Minority" suggests that discrimination against an ethnic minority applicant is lower for women compared to men (reference). On the other hand, the negative value for "Female Majority" suggests that discrimination against an ethnic minority applicant is higher when the majority applicant is a woman rather than a man (reference).

We reported the results of the three regression models by blocks, starting with the characteristics of the protocol and agents first (1), then adding characteristics of applicants (type of information and gender) (2), and then adding the ethnic background (3).

Table 2. Results

	RE Eqn. (1)	WLS Eqn. (1)	FE Eqn. (1)	RE Eqn. (2)	WLS Eqn. (2)	FE Eqn.(2)	RE Eqn. (3)	WLS Eqn. (3)	FE Eqn. (3)
Private landlord (ref)									
Company	0.456***	0.380***	0.380***	0.349***	0.317***	0.317***	0.351***	0.330***	0.330***
	(0.11)	(0.07)	(0.04)	(0.11)	(0.09)	(0.05)	(0.10)	(0.09)	(0.06)
Single inquiries (ref)									
Matched	0.003	0.059	0.059	0.1119	0.113	0.113**	0.088	0.064	0.064
	(0.10)	(0.09)	(0.05)	(0.10)	(0.09)	(0.05)	(0.09)	(0.10)	(0.06)
Europe									
North America	-0.089	0.007	0.007	0.043	0.081	0.081*	-0.232*	-0.159	-0.159**
	(0.14)	(0.11)	(0.04)	(0.13)	(0.13)	(0.05)	(0.14)	(0.18)	(0.07)
No information (ref)									
Detailed information				0.107	0.043	0.043	0.107	0.026	0.026
				(0.08)	(0.07)	(0.03)	(0.07)	(0.11)	(0.04)
Male Minority (ref)									
Female Minority				0.341***	0.351***	0.351***	0.297***	0.331***	0.331***
				(0.07)	(0.04)	(0.03)	(0.06)	(0.05)	(0.03)
Male Majority (ref)									
Female Majority				-0.200***	-0.274***	-0.274***	-0.253***	-0.296***	-0.296***
				(0.07)	(0.05)	(0.03)	(0.06)	(0.04)	(0.03)
Arab/Muslim (ref)									
African							-0.145	-0.058	-0.058
							(0.11)	(0.07)	(0.06)
East European							0.216***	0.149***	0.149***
							(0.08)	(0.05)	(0.04)
Hispanic							0.489***	0.398**	0.398***
							(0.14)	(0.15)	(0.08)
Turkish							-0.162	-0.078	-0.078*
							(0.10)	(0.09)	(0.05)

Notes. Robust standard errors in parentheses. ***p < 0.01, **p < 0.05, and *p < 0.1.

We draw from this analysis five interesting results that are robust to the three estimation method used.

Firstly, it seems that real estate agents discriminate significantly less minority applicants than private landlords. Many factors could explain this lower discrimination of real estate agents: agents could be subject to rules (laws) or at least to prevention against discrimination, while private landlords are not. Their seniority in the trade could make them more confident about minority applicants (while private landlords might be more afraid of the unknown, and thus be more prone to prejudice). In addition, it is riskier for professionals not to comply with legislation. Moreover, the fact that agents often breed a biggest portfolio of clients allows them to spread their risk, thereby reducing statistical discrimination.

Results of all models indicate that adding information in applications does not significantly reduce discrimination. Consistent with meta-analysis results, it seems that landlords show mainly taste-based discrimination.

We may also note that women minority applicants are significantly less discriminated than men. Moreover, discrimination against ethnic minority applicants is higher when majority applicants are women rather than men. Finally, the gender effect is higher for minorities than for majorities, which is in agreement with the result previously found in the meta-analysis. Therefore, the fact that males are discriminated against in the housing market is in opposition to the pattern of discrimination documented in the labor market (Altonji and Blank, 1999). When equal information is provided, men tend to be more prejudiced than women, and this is more pronounced for minority than majority applicants.

It seems that the way of conducting correspondence test would not have significant impact on the results. Indeed, the discrimination reported with the *single inquiries procedure* is similar to the discrimination reported with *matched procedure*.

Finally, and as we easily deduced from the literature review, Hispanic and East European applicants are significantly less discriminated by agents than Arab/Muslim applicants in the rental housing market in OECD countries.

Conclusion

In these meta-analyses, we provide evidence of the occurrence of both ethnic and gender discrimination in OECD rental housing market. At the initial stage of the rental process, we find that majority candidates are almost twice as likely to be chosen by real estate agents or private landlords as applicants belonging to the minority. Moreover, individuals belonging to the majority are more than twice as likely to be favored as Arab/Muslims applicants. An Arab/Muslim candidate has less than one chance out of three to be chosen by agents if he is matched with a majority applicant (with exactly the same characteristics). Female applicants are almost 30% more likely than Male applicants to be chosen. However, this result is different between the group of applicants: women belonging to an ethnic minority are more than 30% more likely than men belonging to the same minority to be chosen by an agent. This result is even higher when we compare Arab/Muslim women with Arab/Muslim men: women are 50% more likely than men to being chosen. Finally, a woman belonging to the majority has "only" 18% more chance than a man belonging to the majority to be chosen. Therefore, there is an interaction of ethnic and gender discrimination: gender discrimination is larger for Minority-sounding

names than for Majority-sounding names meaning that Female majority sounding names are the most favored, while Male minority names are the most disadvantaged (especially Arab/Muslim Male). We also reveal the presence of strong taste-based discrimination: indeed, revealing positive information about the status of the candidate increases the probability of being contacted for both minority and majority applicants in the same proportion. It would not tend to reduce the gap between majority and minority applicants. Unfortunately, taste-based discrimination is harder to fight than statistical discrimination because it comes from preferences rooted in individuals. Discrimination appears to stem more from an education problem than from an information problem. Finally, it seems that real estate agents discriminate significantly less minority applicants than private landlords. These conclusions are robust with random effects (R-E), fixed-effects (F-E) and unrestricted weighted least squares (WLS) models. We hope that our results provide important information for the future development of non-discrimination and equal housing opportunities in the rental housing market in OECD countries.

Acknowledgement

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Figure 1.3: Funnel plot
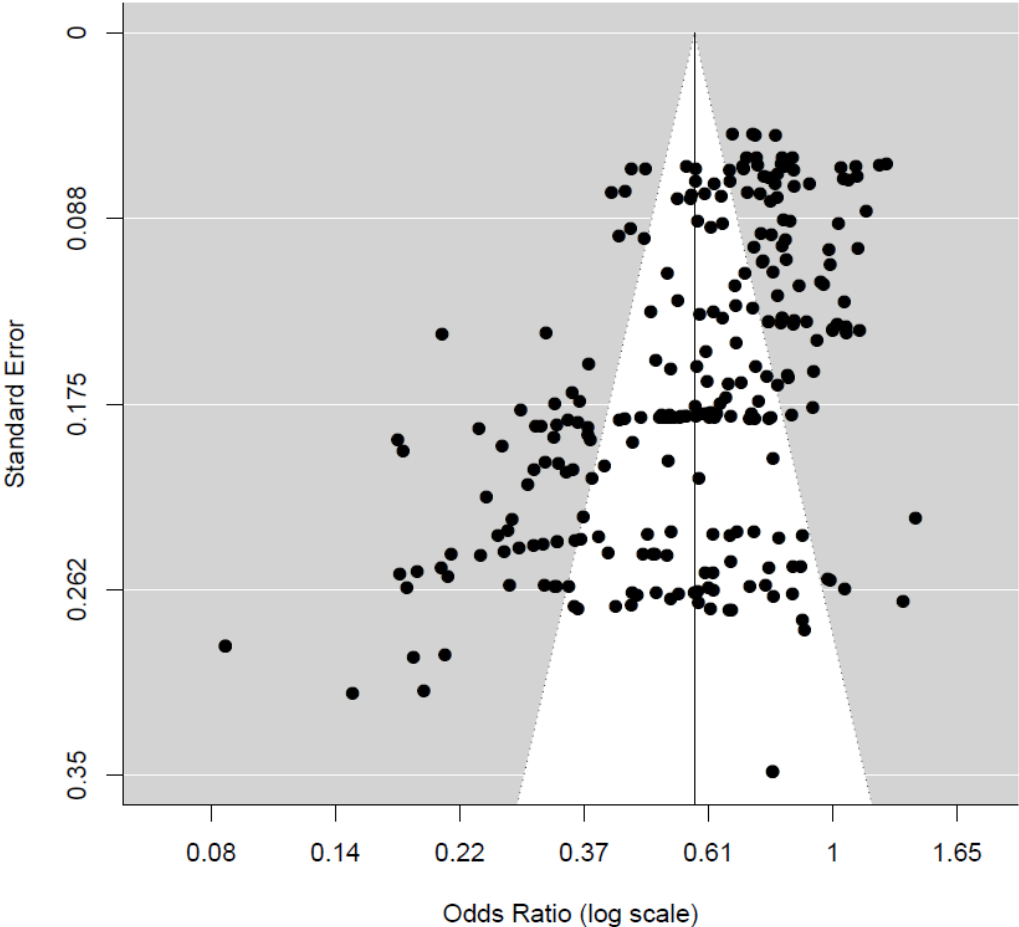
Note: Each dot represents an odd ratio estimated from a test against the standard error of the odd ratio (in log scale), with a reversed scale that places the larger, most powerful studies toward the top.

Figure 1.4: Ethnic and Racial Discrimination in Rental Decisions (correction bias)

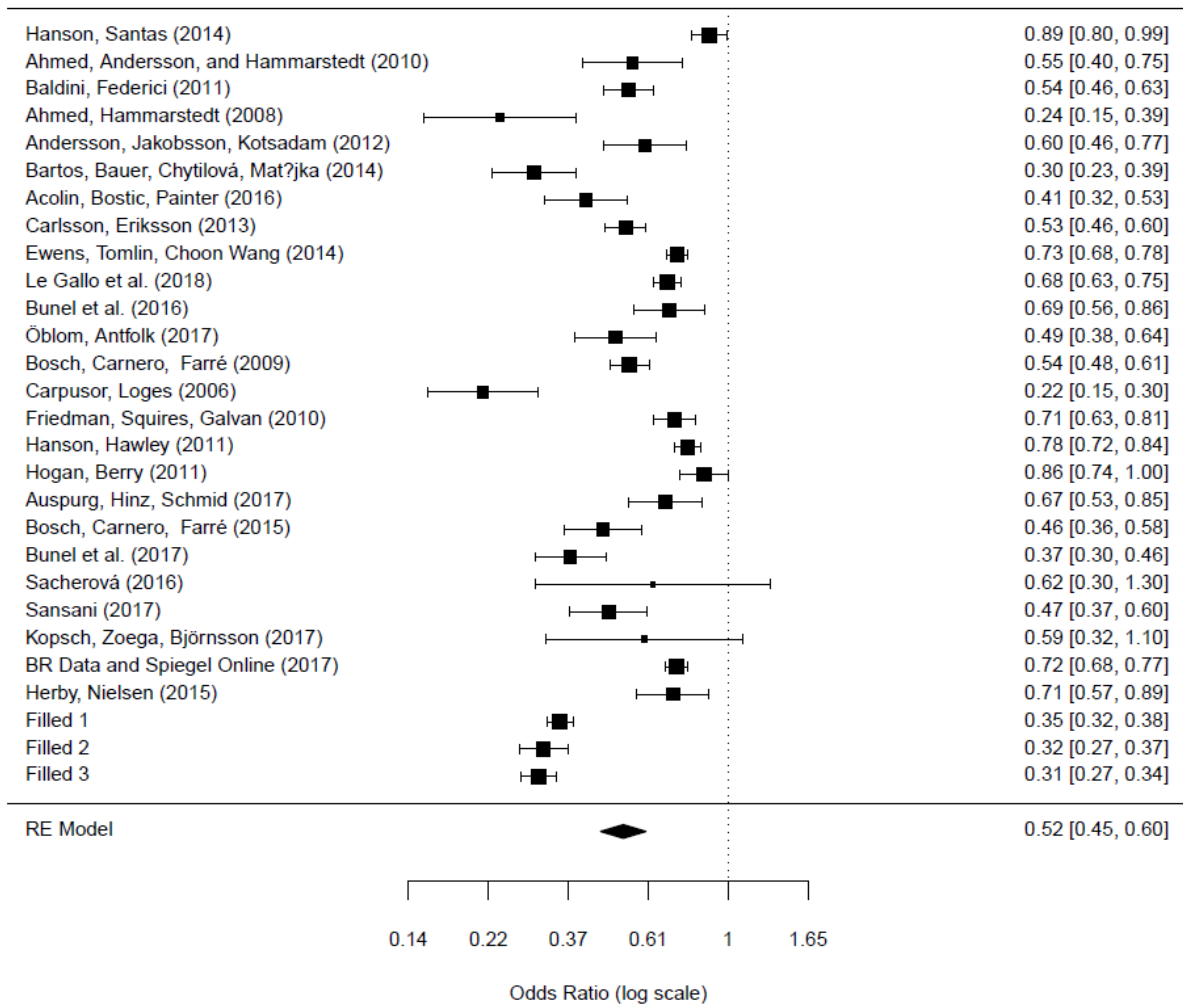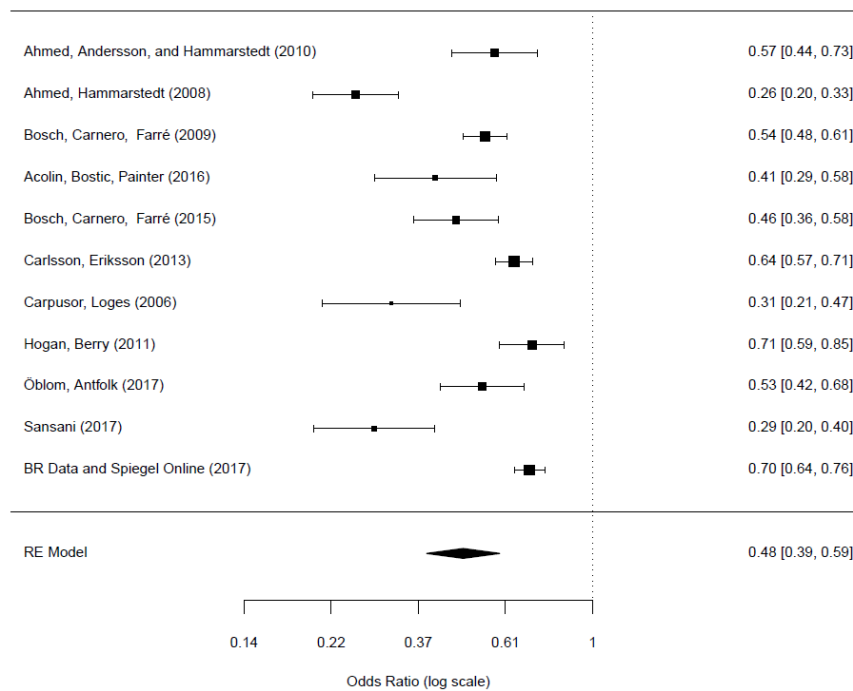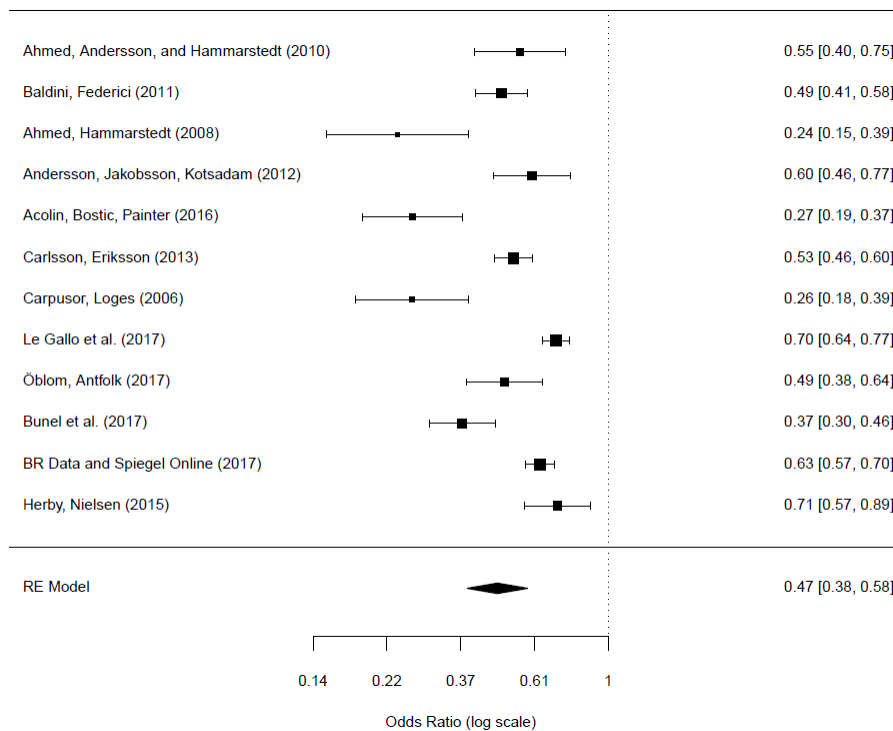| Study	Odds Ratio [95% CI]
Hanson, Santas (2014)	0.89 [0.80, 0.99]
Ahmed, Andersson, and Hammarstedt (2010)	0.55 [0.40, 0.75]
Baldini, Federici (2011)	0.54 [0.46, 0.63]
Ahmed, Hammarstedt (2008)	0.24 [0.15, 0.39]
Andersson, Jakobsson, Kotsadam (2012)	0.60 [0.46, 0.77]
Bartos, Bauer, Chytilová, Mat?jka (2014)	0.30 [0.23, 0.39]
Acolin, Bostic, Painter (2016)	0.41 [0.32, 0.53]
Carlsson, Eriksson (2013)	0.53 [0.46, 0.60]
Ewens, Tomlin, Choon Wang (2014)	0.73 [0.68, 0.78]
Le Gallo et al. (2018)	0.68 [0.63, 0.75]
Bunel et al. (2016)	0.69 [0.56, 0.86]
Öblom, Antfolk (2017)	0.49 [0.38, 0.64]
Bosch, Carnero, Farré (2009)	0.54 [0.48, 0.61]
Carpusor, Loges (2006)	0.22 [0.15, 0.30]
Friedman, Squires, Galvan (2010)	0.71 [0.63, 0.81]
Hanson, Hawley (2011)	0.78 [0.72, 0.84]
Hogan, Berry (2011)	0.86 [0.74, 1.00]
Auspurg, Hinz, Schmid (2017)	0.67 [0.53, 0.85]
Bosch, Carnero, Farré (2015)	0.46 [0.36, 0.58]
Bunel et al. (2017)	0.37 [0.30, 0.46]
Sacherová (2016)	0.62 [0.30, 1.30]
Sansani (2017)	0.47 [0.37, 0.60]
Kopsch, Zoega, Björnsson (2017)	0.59 [0.32, 1.10]
BR Data and Spiegel Online (2017)	0.72 [0.68, 0.77]
Herby, Nielsen (2015)	0.71 [0.57, 0.89]
Filled 1	0.35 [0.32, 0.38]
Filled 2	0.32 [0.27, 0.37]
Filled 3	0.31 [0.27, 0.34]
RE Model	0.52 [0.45, 0.60]

Odds Ratio (log scale)
0.14 0.22 0.37 0.61 1 1.65

Note: This forest plot (figure 1.3) displays the odds ratios in log scale of each study (point estimate as square, two standard errors as lines). At the bottom, the lozenge indicates the effect size across studies (N = 28: study level). Three fictitious studies are generated by the trim-fill method in order to correct publication bias.

Figure 2.1: Discrimination against Arab/Muslim in Rental Decisions (Simple response)

|	
Ahmed, Andersson, and Hammarstedt (2010)	0.57 [0.44, 0.73]
Ahmed, Hammarstedt (2008)	0.26 [0.20, 0.33]
Bosch, Carnero, Farré (2009)	0.54 [0.48, 0.61]
Acolin, Bostic, Painter (2016)	0.41 [0.29, 0.58]
Bosch, Carnero, Farré (2015)	0.46 [0.36, 0.58]
Carlsson, Eriksson (2013)	0.64 [0.57, 0.71]
Carpusor, Loges (2006)	0.31 [0.21, 0.47]
Hogan, Berry (2011)	0.71 [0.59, 0.85]
Öblom, Antfolk (2017)	0.53 [0.42, 0.68]
Sansani (2017)	0.29 [0.20, 0.40]
BR Data and Spiegel Online (2017)	0.70 [0.64, 0.76]
RE Model	0.48 [0.39, 0.59]

Odds Ratio (log scale)

Note: This forest plot (figure 3.1) displays the odds ratios in log scale of each study deferring discrimination against Arab-Muslims by simple response (point estimate as square, two standard errors as lines). At the bottom, the lozenge indicates the effect size across studies (N = 11: study level).

Figure 2.2: Discrimination against Arab/Muslim in Rental Decisions (Positive response)

|	
Ahmed, Andersson, and Hammarstedt (2010)	0.55 [0.40, 0.75]
Baldini, Federici (2011)	0.49 [0.41, 0.58]
Ahmed, Hammarstedt (2008)	0.24 [0.15, 0.39]
Andersson, Jakobsson, Kotsadam (2012)	0.60 [0.46, 0.77]
Acolin, Bostic, Painter (2016)	0.27 [0.19, 0.37]
Carlsson, Eriksson (2013)	0.53 [0.46, 0.60]
Carpusor, Loges (2006)	0.26 [0.18, 0.39]
Le Gallo et al. (2017)	0.70 [0.64, 0.77]
Öblom, Antfolk (2017)	0.49 [0.38, 0.64]
Bunel et al. (2017)	0.37 [0.30, 0.46]
BR Data and Spiegel Online (2017)	0.63 [0.57, 0.70]
Herby, Nielsen (2015)	0.71 [0.57, 0.89]
RE Model	0.47 [0.38, 0.58]

Odds Ratio (log scale)

Note: This forest plot (figure 3.2) displays the odds ratios in log scale of each study deferring discrimination against Arab-Muslims by positive response (point estimate as square, two standard errors as lines). At the bottom, the lozenge indicates the effect size across studies (N = 12: study level).

## Figure 3.3: Gender Discrimination in Rental Decisions (Arab/Muslim applicants)
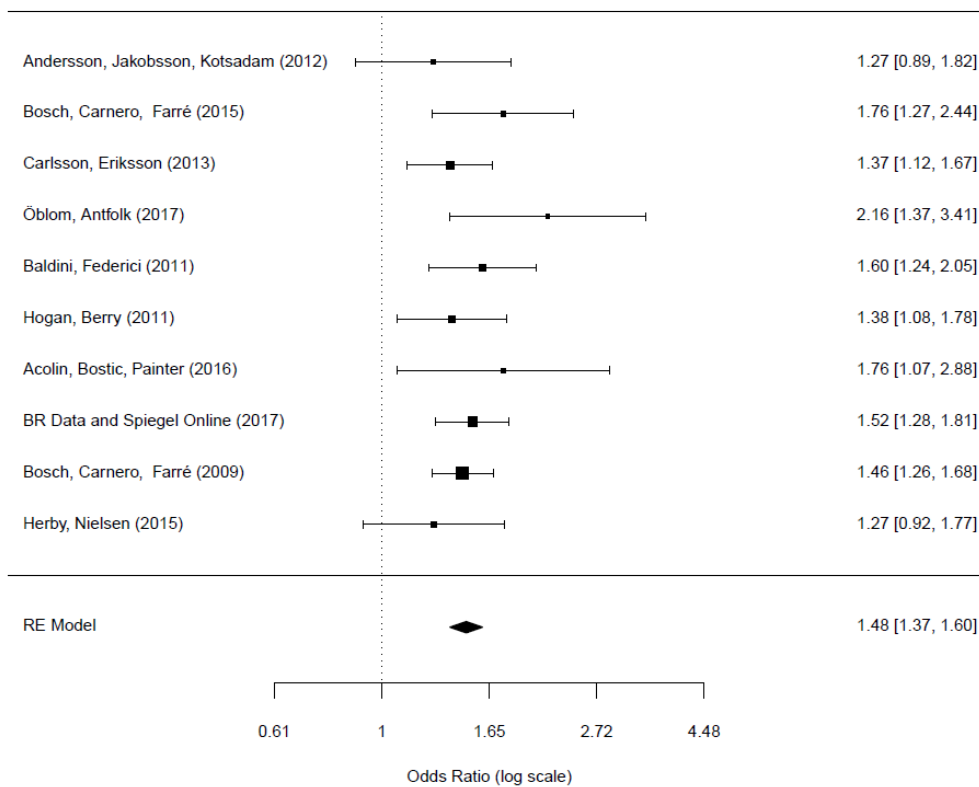
Note: This forest plot (figure 4.3) displays the odds ratios between male and female Arab/Muslim applicants (in log scale) of each study (point estimate as square, two standard errors as lines). At the bottom, the lozenge indicates the effect size across studies (N = 10: study level).

Figure 4.1 Effect of providing correct information on majority candidates
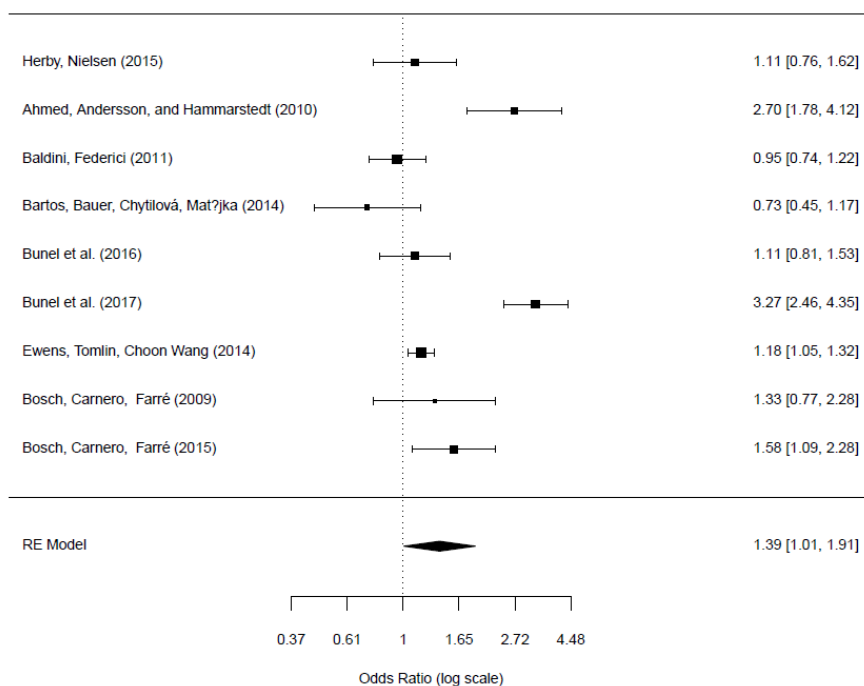
Note: This forest plot (figure 4.3) displays the odds ratios between majority applicants with "detailed information" and majority applicants with "no information" (in log scale) of each study (point estimate as square, two standard errors as lines). At the bottom, the lozenge indicates the effect size across studies (N = 9: study level).

Figure 4.2: Effect of providing correct information on minority candidates
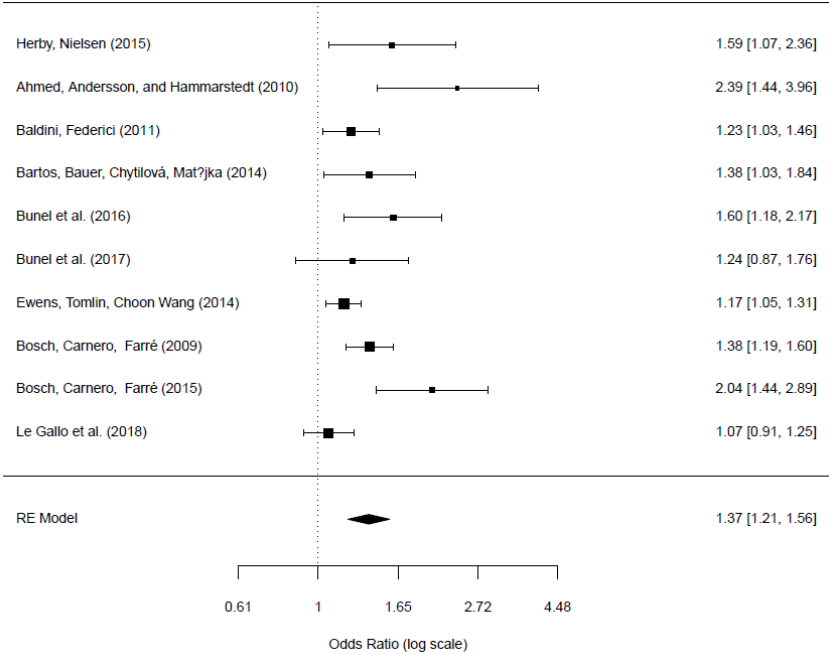
Note: This forest plot (figure 4.3) displays the odds ratios between minority applicants with "detailed information" and minority applicants with "no information" (in log scale) of each study (point estimate as square, two standard errors as lines). At the bottom, the lozenge indicates the effect size across studies (N = 10: study level).